TUOLUMNE RIVER MINING REACH RESTORATION PROJECT
PROJECT NO. 2 MJ RUDDY SEGMENT

VII. COMPLIANCE WITH STANDARD TERMS & CONDITIONS

Applicant is a public entity. The applicable RFP project group type is Group C, Public Works Construction.

The applicant agrees to the terms and conditions of the Request for Proposals dated May 1998 and as amended by CALFED's Responses to RFP Questions dated 2 June 1998 and applicant intends to comply with those terms and conditions.

It is anticipated that a majority of the public works construction effort will be performed by private contractors. The applicant will be deferring the requirement for submission of bid & payment bonds until such time as each subcontract is sought and awarded and before any work under the subcontract is performed.

Enclosed are the following completed forms:

Nondiscrimination Compliance Statement, RFP Item No. 7

Submitted by:

TURLOCK IRRIGATION DISTRICT

By Paul D. Elias

Paul D. Elias, General Manager

Date: 30 June 1998

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ONDISCRIMINATION COMPLIANCE STATEMENT

ITEM 7

MPANY NAME
Turlock Irrigation District

The company named above (hereinafter referred to as "prospective contractor") hereby certifies, unless specifically exempted, compliance with Government Code Section 12990 (a-f) and California Code of Regulations, Title 2, Division 4, Chapter 5 in matters relating to reporting requirements and the development, implementation and maintenance of a Nondiscrimination Program. Prospective contractor agrees not to unlawfully discriminate, harass or allow harassment against any employee or applicant for employment because of sex, race, color, ancestry, religious creed, national origin, disability (including HIV and AIDS), medical condition (cancer), age, marital status, denial of family and medical care leave and denial of pregnancy disability leave.

CERTIFICATION

I, the official named below, hereby swear that I am duly authorized to legally bind the prospective contractor to the above described certification. I am fully aware that this certification, executed on the date and in the county below, is made under penalty of perjury under the laws of the State of California.

FICIAL'S NAME
Paul D. Elias

TE EXECUTED
June 30, 1998

EXECUTED IN THE COUNTY OF
Stanislaus

OSPECTIVE CONTRACTOR'S SIGNATURE
Paul D. Elias

OSPECTIVE CONTRACTOR'S TITLE
General Manager

OSPECTIVE CONTRACTOR'S LEGAL BUSINESS NAME
Turlock Irrigation District

Appendix 1

Mining Reach Restoration Project Proposal

TUOLUMNE RIVER FLOODWAY EMERGENCY REPAIR AND LONG-TERM HABITAT RESTORATION PROJECT PROPOSAL

7-11 Materials, Santa Fe Aggregates, and Reed Gravel Mining Reach, Stanislaus County, River Mile 34.2 to 40.3

Prepared for:

Tuolumne River Technical Advisory Committee
(Don Pedro Project, FERC License No. 2299)
and
Tuolumne River Stakeholders Group

July 17, 1997

Prepared by:

McBain and Trush
P.O. Box 663
824 L Street, Studio 5
Arcata, CA 95521
(707) 826-7794

INTRODUCTION

The January 1997 flood event on the Tuolumne River, with an unregulated peak magnitude estimated at 130,000 cfs, was the largest flood since the legendary flood of 1862. The flood release from New Don Pedro Reservoir peaked at nearly 60,000 cfs on January 3 (higher flows have occurred prior to construction of New Don Pedro). While some damage to the floodway occurred in reaches relatively undisturbed by human land use, reaches with extensive land use (urban encroachment, aggregate extraction, sewage treatment plants, bridges) were much more heavily damaged. One of these heavily damaged reaches was the aggregate extraction reach upstream of Waterford.

The aggregate industry, stakeholders and representatives of potential funding sources, including CALFED, met in Modesto on April 3, 1997 to discuss long-term habitat restoration and funding options. This document attempts to better illustrate the scope, approach, and cost of restoring habitat and creating an adequate floodway through this six-mile reach of the Tuolumne River as requested at the 3 April 1997 meeting. An initial meeting with landowners was held on 10 April 1997 to discuss the proposed concept. A follow-up meeting to the 3 April meeting was held in Modesto on 21 April at the Modesto Irrigation District (MID) office. Due to the complexities of many landowners, lease agreements with individual aggregate miners, preliminary topographical information, unconfirmed sources for restoration materials (vegetation, aggregate, and topsoil), and the short time frame provided for this analysis, the cost estimates and details should be considered provisional. Some of the specifics described below may change as discussions progress. Currently, the lead agency for this project has not been formally identified; however, Turlock Irrigation District (TID) has been acting in this role. There will be many agencies actively participating in this project, along with the local aggregate companies and landowners.

BACKGROUND

The Tuolumne River, one of the three main tributaries of the San Joaquin River, is typical of most central valley rivers that drain the west slope of the Sierra Nevada (Figure 1). It has an extensive history of gold mining, municipal and agricultural water storage, power generation, agriculture, and recreation. The river channel upstream of river mile 25 (Geer Road) has had two major legacies of disturbance. From the 1850's to the 1950's, extensive placer and dredger mining for gold occurred from La Grange (river mile 51) to below Roberts Ferry Bridge (river mile 37.5). Much of the gravel spoils (tailings) from these gold mining activities were removed in the late 1960's for constructing the New Don Pedro Dam project. Large scale aggregate mining (sand and gravel) began in this reach in the 1940's, first with instream mining, then later with floodplain/terrace pit mining that continues today. This activity not only caused mounds of dredger tailings and deep pits, but also removed riparian vegetation and reduced the width of the Tuolumne River riparian corridor (Figure 2). The reduction in riparian corridor width was greatest in the aggregate extraction reach (Table 1.)

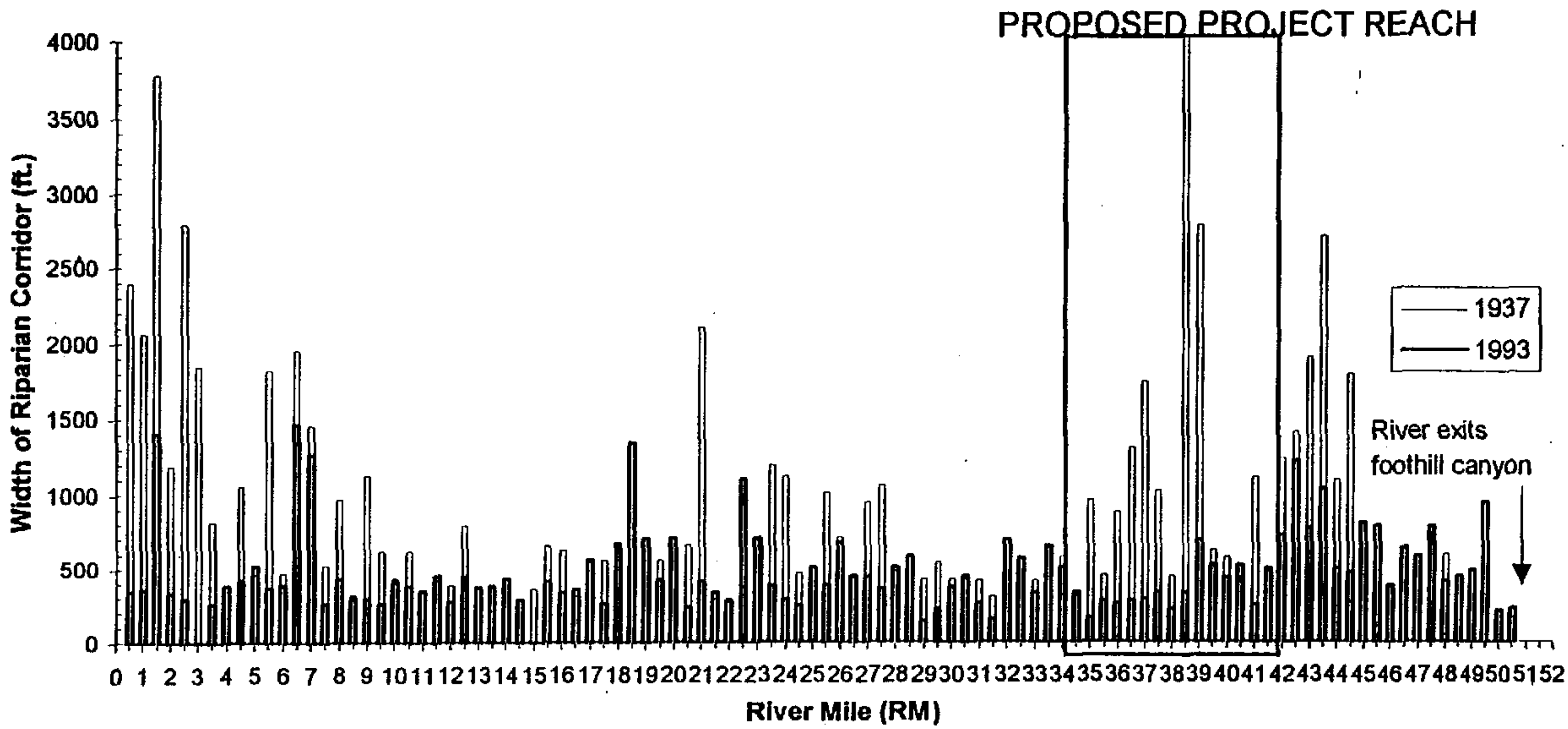

Figure 2 Riparian corridor widths from 1937 and 1993 aerial photographs at half mile intervals, beginning at the Tuolumne River confluence with the San Joaquin River (RM 0) and ending just upstream of the new La Grange bridge (RM 51.5). The Tuolumne River riparian corridor was already significantly altered in 1937 by gold dredging, agricultural and urban encroachment).

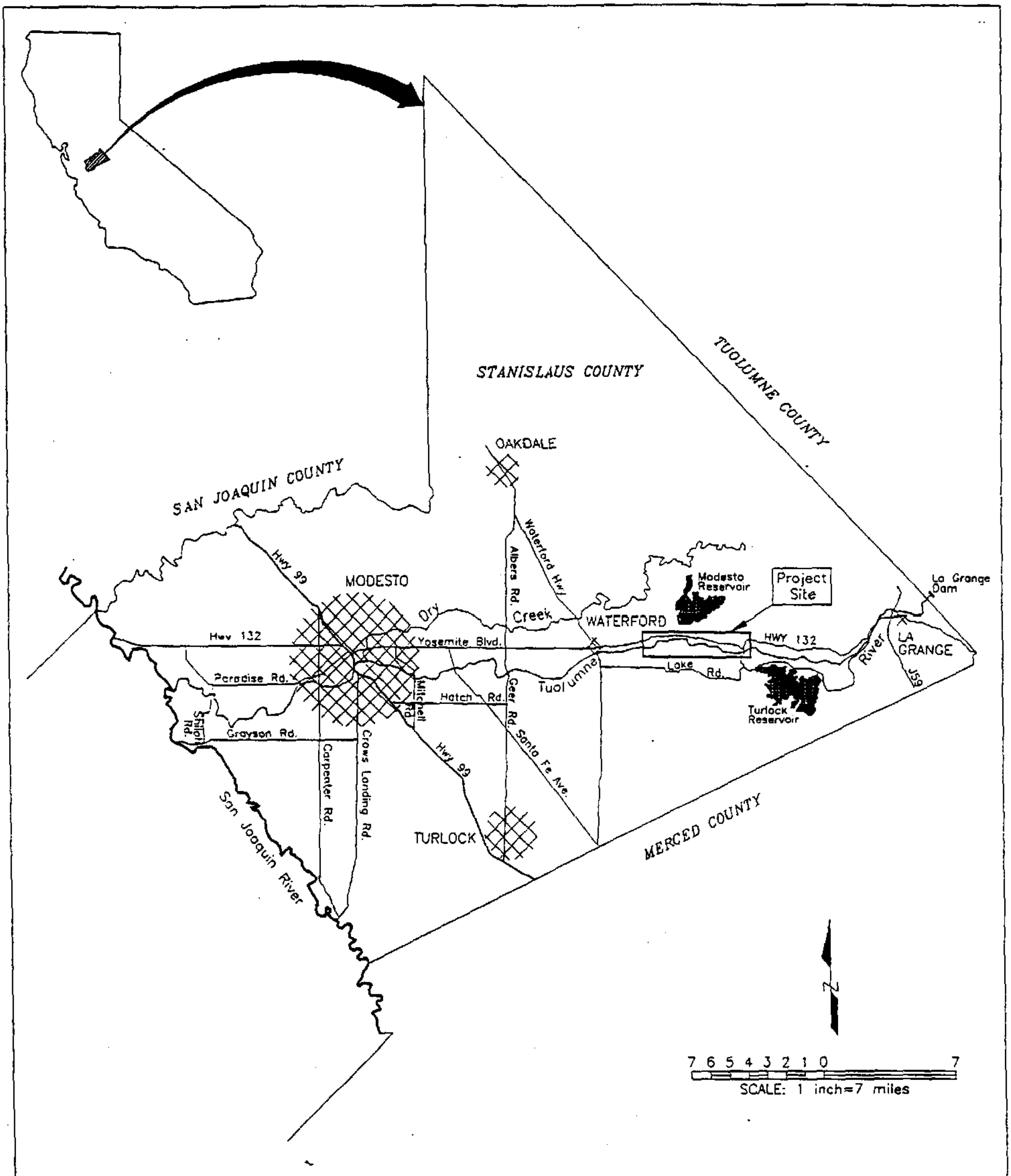

FIGURE 1. PROPOSED FLOODWAY DESIGN TUOLUMNE RIVER MILE 34.2 TO 40.3

McBain & Trush 1997

Table 1: Riparian corridor width descriptive statistics for river mile 33.5 to river mile 40.5

	1993 Riparian Corridor Width	1937 Riparian Corridor Width
Mean width	387.8 feet	1100 feet
Median width	336 feet	620 feet
Maximum width	686 feet	4000 feet
Minimum width	164.5 feet	310 feet

The Tuolumne River also supports a population of fall-run chinook salmon, whose numbers have fluctuated from 40,000 fish in 1985, to a low of 100 fish in 1991, and is on another upward swing with 3,300 spawners in 1996. One of many stressors identified in recent studies on the Tuolumne River that limit salmonid populations is the aggregate extraction pits, which are a byproduct of extensive in-stream and off-channel mining. Many of these instream and off-channel pits have negatively impacted salmonid populations by stranding juveniles in ponds and fostering predator populations (bass). Additionally, spawning and rearing habitats have been negatively impacted by either complete removal during the aggregate extraction, degradation by channel encroachment, or fine sediment infiltration. Many of the off channel pits had a small topsoil berm separating them from the river. Common floods (e.g., 1983, 1986, 1995) of less than 11,000 cfs have breached some of these berms. Finally, the January 1997 flood (estimated at 59,000 cfs) breached nearly every berm in the reach, resulting in a channel capture through aggregate pits to the south of the 7/11 Aggregates plant (Figure 3) and breaching of berms at downstream aggregate pits (Figures 4 through 6). Aggregate miners have since completed emergency repairs to separate some of the ponds from the Tuolumne River and place the river back into its pre-flood channel; however, most of these emergency repairs are only a temporary solution.

The Turlock and Modesto Irrigation Districts are urging the Army Corps of Engineers to increase the allowable flood release from the present 9,000 cfs to 20,000 cfs at Modesto to improve flood management. This will require further upgrades of levees/berms in this reach. Rather than rebuild these berms/levees in their pre-flood location and height, which in many cases are already known to be inadequate, we propose a program of partnership with the aggregate miners and other entities to rebuild the berms as setback levees, creating a riparian floodway with a minimum width of 500 to 600 feet. This floodway width should safely convey discharges of 15,000 to 20,000 cfs with fully grown riparian vegetation and a reasonable safety factor (Figures 7 and 8). Existing reaches with greater width would be maintained as additional floodway/habitat areas.

The ecological benefits of a restored floodway, increased floodway capacity downstream of La Grange, long-term flood protection in this reach, and more variable flood flow regime, presents a unique opportunity of common objectives among the irrigation districts, landowners, mining interests, and restorationists.

OBJECTIVES

The goal of this project is to restore riparian habitats, salmonid habitats, and a continuous floodway through this six-mile reach of the Tuolumne River. Objectives include:

1. Improve salmonid spawning and rearing habitats by restoring an alternate bar (pool-riffle) morphology, restoring spawning habitat within the meandering channel, and filling in-channel mining pits
2. Improve juvenile salmonid survival by preventing future connection between the Tuolumne River and off-channel mining pits
3. Restore native riparian communities on appropriate geomorphic surfaces (i.e., active channel, floodplains, terraces) within the restored floodway
4. Restore habitats for special status species (e.g., egrets, ospreys, herons)
5. Isolate off channel aggregate extraction pits that were connected to the Tuolumne River by the January 1997 flood
6. Restore a floodway width that will safely convey floods up to 20,000 cfs
7. Allow channel ability to migrate within restored floodway to improve and maintain riparian and salmonid habitat
8. Remove floodway "bottleneck" created by inadequate berms have caused (e.g., berm failure above a certain discharge threshold)
9. Protect aggregate extraction operations, bridges, and other human structures from future flood damage

APPROACH

The proposed approach attempts to restore a functional floodway through this impacted reach by constructing setback levees. These levees, constructed at least 500 feet apart, would define the long-term riverine and riparian corridor for the Tuolumne River. The long-term viability of this corridor would be preserved by landowners, or with a combination of land purchases (most likely in pond areas) and riparian conservation easements (in un-mined areas adjacent to the river). The post-dam low water channel width is approximately 100 feet, and the present post-dam bankfull channel width (the channel below the floodplain elevation) is approximately 200 feet. With this proposal, the resulting floodplain/terrace width would be a minimum of 300 feet, for a total combined minimum floodway width of 500 feet (Figures 7 and 8). This would allow room for the channel to migrate within the floodplain without capturing aggregate mining pits and destroying human structures.

Due to the large scale of the project, completion will take at least 2 to 3 years. Therefore, we propose to implement the project in two phases. The first phase targets immediate needs, including replacing destroyed berm/levees as setback levees (as opposed to reconstructing them in the pre-flood location), bioengineering bank protection (as opposed to rip-rap, Figure 9), and revegetation with native woody riparian species. The second phase would remove most narrowing berms and replace them with setback levees, restore former floodplains by filling portions of mining pits, reconstruct portions of the low water channel to a more natural morphology, and revegetate floodplains with native woody riparian species (Figure 8).

The proposed activity includes State and Federal cost-sharing with the aggregate miners, most of which would occur in Phase 1. The aggregate miners have legal responsibility to maintain the berms as part of their permitted operations, thus it is proposed to apply that responsibility to replacing the berms as setback levees. Public moneys would be applied to constructing setback levees in areas where berms/levees were not destroyed, rebuilding floodplains and low water channels, and riparian revegetation. A primary benefit of the project is to remove the floodway "bottleneck" created from the berms left by aggregate extraction operations. Planning is underway to remove urban bottlenecks near Modesto to convey flows up to 20,000 cfs, so restoring a floodway in this reach would remove another hurdle for facilitating a higher flood flow regime. Other project benefits include:

- restores a riparian floodway corridor that is sized to the post-dam flow regime (Figures 7 and 8)
- restores bankfull channel and floodplain sized to the post-dam flow regime (Figures 7 and 8)
- restores a continuous riparian corridor (by revegetating barren banks and connecting fragmented riparian stands) (Figures 3-6)
- restores large areas of cottonwood and valley oak communities that existed historically, providing critical perching, roosting, and nesting habitat for raptors, egrets, and herons (Figures 7 and 8)
- increases channel flood flow storage and accommodates future flood flow releases
- restores a pool-riffle morphology, encouraging a greater diversity in instream habitats (particularly salmonid habitats)
- enables the channel to migrate through floodplains and terraces, discouraging levee erosion during any single high flow event
- protection from future channel capture and river-to-pit connection during high flows
- decrease in chinook salmon mortality from stranding and bass predation
- improved chinook salmon rearing and spawning habitat
- increased riparian corridor width will improve wildlife migration corridor and increase the aerial extent of wildlife habitat

REACH AND PRIORITY DELINEATION, PROJECT DESCRIPTION

The objective of Phase 1 items are to eliminate flow and salmonid access to mining pits during periods of high flow. The timeline for CALFED funding (see below) could require construction when adult chinook salmon are migrating upstream and spawning. In-channel construction phases would have to commence after smolt outmigration (June 15) and be completed by the start of adult migration (September 30). Thus, this project is phased to minimize disturbance to salmonids and implement time sensitive portions of the project first (e.g., isolating ponds from the river). Cost sharing has been discussed with the aggregate miners in the reach, and results of these discussions are used in the budget estimates below. Based on regulatory conditions in their permits, certain tasks, such as maintenance of a 9,000 to 11,000 cfs floodway, are their responsibility to implement and constitute portions of industry cost-sharing. Based on this interpretation of the aggregate industry's responsibilities, and discussions with them regarding their reconstruction plans, the anticipated funding source for each task is represented as follows: "PUBLIC" represents public funding sources (e.g., AFRP), and "7/11", "SANTA FE", and "REED" represent anticipated respective aggregate industry responsibility. "Native woody riparian species" includes several willow species on lower gravel bar surfaces, white alders and boxelders at the edges of the active channel, cottonwoods and black willow on floodplain surfaces, and valley oak on floodplain/terrace surfaces.

The six miles of this project has been divided into four reaches: 7/11 reach, Ruddy reach, Warner/Deardorff reach, and the Reed reach. These delineations were created based on land ownership and sphere of influence of the aggregate extraction operations.

7/11 REACH

This reach is defined by the extent of 7/11 aggregate extraction upstream of Roberts Ferry bridge (river mile 40.3) downstream to the M.J. Ruddy property line below the 7/11 plant site (river mile 37.7) (Figure 3). Impact of the 1997 flood included channel capture through aggregate ponds to the south of the 7/11 plant site (river mile 39 to 37.6), river capture of the 7/11 settling pond near the haul road bridge (river mile 37.9), and damage to berms/levees upstream of the 7/11 plant site (river mile 38.1 to 38.6).

Phase 1

A. Build setback levee/haul road on south bank from river mile 38.8 to 39.1 (preventing pond connection by flows up to 15,000 to 20,000 cfs) and revegetate toe of levee (cost-sharing: PUBLIC and 7/11 expense)
B. Upgrade existing south bank levee upstream of 7/11 plant site at river mile 38.1 to 38.7 by moving haul road south approximately 25 feet and building a small terrace on river side of haul road (cost-sharing: PUBLIC and 7/11 expense)
C. Extend rip-rap toe on north bank of river at haul road bridge upstream 300 feet, and revegetate rip-rap and constructed terrace (7/11 expense)
D. Construct ford on south approach to haul road bridge. Crossing should have concrete aprons with several 48" culverts that would supplement bridge flow conveyance when the stream discharge is between 5,000 and 10,000 cfs, preventing disruption of aggregate operations. At flows greater than 10,000 cfs, the culvert capacity will be exceeded and water would flow over the concrete apron onto the downstream floodplain (7/11 expense). An alternative option of a second bridge span could be considered in lieu of a ford.

Phase 2

A. Regrade extracted dredger tailing area on the south bank upstream of Roberts Ferry Bridge (river mile 40.3) to create a floodplain. Revegetate with native woody riparian species. (7/11 expense for regrading, PUBLIC expense for revegetation)

B. Purchase dredger tailing mineral rights between the extraction area and the Tuolumne River at river mile 40.3, restoring riparian floodway habitat at this location and using material to restore downstream floodplains
C. Secure riparian conservation easement on south bank from river mile 39.2 to 39.8.
D. Construct floodplain on south bank from river mile 38.8 to 39.1, reshape low water channel, and revegetate (PUBLIC expense)
E. Grade north bank gravel bar at river mile 38.3 to increase flood capacity and generate aggregate and riparian vegetation for restoration (PUBLIC expense)
F. Construct setback levee through south bank settling pond downstream of the 7/11 plant site from river mile 37.7 to 37.9 (PUBLIC expense)
G. Construct floodplain in settling pond from river mile 37.7 to 37.9 and revegetate with native woody riparian species (PUBLIC expense)
H. Construct floodplain in downstream south bank pond at river mile 37.6 and revegetate with native woody riparian species (PUBLIC expense)

M.J. RUDDY REACH

This reach is defined by the property line upstream of Joe Ruddy's orchard (river mile 37.7) downstream to Santa Fe haul road bridge (river mile 36.6) (Figure 4). The 1997 flood damaged the south bank of the 4-Pumps restoration project at river mile 37.5, connected to south bank ponds at river mile 37.1, 36.6, and 36.2, and connected to a north bank pond at river mile 36.7.

Phase 1

E ~~F~~. Patch levees downstream of Joe Ruddy's orchard at river mile 36.9 and 37.1(Under construction, at SANTA FE and LANDOWNER expense)
F ~~G~~. Patch south bank levee downstream of the haul road bridge river mile 36.6 (Done, at SANTA FE expense)

Phase 2

A. Build setback levee across south bank pond upstream of Joe Ruddy's orchard (river mile 37.6 to 37.7, isolating it from the river (cost-sharing: PUBLIC and LANDOWNER expense)
B. Reconstruct portions of the low water channel in the 4-Pumps restoration site from river mile 36.8 to 37.6, bioengineer approximately 500' of the south bank adjacent to orchard, and revegetate with native woody riparian species (PUBLIC expense)
C. Construct setback levee through south bank pond upstream of haul road bridge from river mile 36.6 to 36.9, construct floodplain, and revegetate with native woody riparian species (PUBLIC expense)
D. Construct setback levee through north bank settling pond upstream of haul road bridge from river mile 36.7 to 36.8, construct floodplain, and revegetate with native woody riparian species (PUBLIC expense)
E. Construct ford on north approach to haul road bridge at river mile 36.7. Crossing should have concrete aprons, and would convey flows greater than 6,000 cfs onto the downstream floodplain (SANTA FE expense).

WARNER/DEARDORFF REACH

The Warner/Deardorff reach is defined by the Santa Fe Aggregates haul road bridge (river mile 36.6) downstream to the entrance to Dan Casey Slough (river mile 35.2) (Figure 5). Damage during the 1997 flood consisted of numerous berm failures on the south bank downstream of the haul road bridge, destruction of the conveyor bridge, and connection of the Tuolumne River to the Tulare Pond at flows greater than 2,000 cfs.

Phase 1

G. Patch south bank levee from river mile 36.2 to 36.3 to prevent flood flow access to pond, and provide flood flow conveyance that would protect an extended conveyor bridge crossing (SANTA FE expense)

H. Bioengineering to protect the south bank levee and proposed conveyor bridge abutment from river mile 36.2 to 36.3 from future channel migration using bioengineering, and revegetate with native woody riparian species (PUBLIC expense).

Phase 2

H. Regrade aggregate storage area on north bank downstream of the haul road bridge from river mile 36.2 to 36.7 to convey high flows, reconstruct small levee if needed, purchase mineral rights if needed, and revegetate with native woody riparian species (PUBLIC expense)

I. Purchase mineral rights in Tulare Pond from river mile 35.7 to 36.2 to obtain materials for setback levee and floodplain construction (PUBLIC expense)

J. Construct setback levee and floodplain through pond using this material, regrade portions of the low water channel, and revegetate floodplain with native woody riparian species (PUBLIC expense)

K. Secure conservation easement or purchase mineral rights to south bank pre-dam floodplain from river mile 35.4 to 35.7, lower selected surfaces to post-dam floodplain elevation, use material to help fill Tulare Pond upstream, and revegetate (PUBLIC expense)

REED REACH

The Reed reach is defined by the entrance to Dan Casey Slough on the upstream end (river mile 35.2) and the downstream extent of the Reed Mitigation restoration project on the downstream end (river mile 34.3) (Figure 6). Damage during the 1997 flood was minimal, limited to the upstream and downstream ends of the existing south bank pond at river mile 34.5.

Phase 1

J. Block flood flow access to pond entrance and exit (river mile 34.4, 34.5, and 34.65) for flows less than 11,000 cfs (REED expense)

Phase 2

N. Purchase mineral rights in Reed pond area for setback levee and floodplain construction, lower selected surfaces downstream of pond to post-dam floodplain elevation, and use material to help fill pond (PUBLIC expense)

O. Construct setback levee through pond from river mile 34.4 to 34.7, create floodplain, and revegetate floodplain with native woody riparian species (PUBLIC expense)

MONITORING

The large size of this project and the objective of preventative maintenance to restore and preserve salmonid habitats necessitates a monitoring program that focuses on discrete issues. For example, one primary objective of restoring a larger functional floodway is to prevent future salmonid mortality from pit connection or capture, which can be simply monitored by documenting the reduced occurrences of levee failure. More detailed monitoring should target the effectiveness of differing bioengineering approaches, testing different riparian restoration strategies (e.g., irrigation, cuttings, creation of surfaces conducive to natural regeneration), channel migration rates, and salmonid spawning and rearing use within the restored floodway.

TIMELINE

PHASE 1

Optimum funding date: 7/1/97
Field reconnaissance, final design documents, and field staking: 7/1/97-9/1/97
Permitting: 7/1/97-9/1/97
Construction: 9/1/97-4/98
Revegetation (mostly bank protection on outsides of meander bends): 11/1/97-1/1/98

PHASE 2

Expected funding dates: 9/1/97 and 9/1/98
Field reconnaissance, final design documents, and field staking: 9/1/97-4/1/98
Permitting: 9/1/97-4/1/98
Construction: 6/1/98-10/30/99
Revegetation: 1/98-11/99
Monitoring: 11/99-2001

COSTS

The costs provided below are delineated by reach and by phase, and estimate PUBLIC costs only. Phase 1 items are deemed "fast track" items to be implemented in FY1997, thus should have priority for immediate funding. Phase 2 items target implementation in FY1998 and 1999, so appropriating funding in FY1997 would provide ample time for final designs and permit procurement in a more reasonable time frame. Permitting could also be separate for Phase 1 and 2 due to the differing time frame for each. More detail for the following cost estimates are provided in Table 2. Conservative cost estimates for the material purchase, earth moving, transportation, and other "big ticket" items were made to prevent underestimating project costs, and as an additional conservative measure, a contingency of 10 percent of construction costs were also added.

Phase 1

Permitting, field reconnaissance, and design	$190,000
Field staking, construction supervision	$76,000
Aggregate, topsoil, and other materials; Construction	$526,000
Riparian revegetation and bioengineering	$278,000
Project management and administration (3%)	$32,000
TOTAL PHASE 1 COST TO PUBLIC FUNDING SOURCES:	**$1,102,000**

Phase 2

Permitting, field reconnaissance, and design	$395,000
Field staking, construction supervision	$114,000
Aggregate, topsoil, and mineral rights/land purchase; Construction	$12,812,000
Riparian revegetation and bioengineering	$1,097,000
Monitoring	$150,000
Project management and administration (3%)	$434,000
TOTAL PHASE 2 COST TO PUBLIC FUNDING SOURCES:	**$15,001,000**
CONTINGENCY (10% of construction):	**$1,471,000**
GRAND TOTAL:	$17,574,000

TABLE 1. COST SUMMARY FOR RESTORING TUOLUMNE RIVER FLOODWAY THROUGH GRAVEL MINING REACH

Estimated bioengineering cost (labor and materials)=	$200/ft
Estimated floodplain revegetation cost (labor and materials)=	$7,000/acre
Estimated mineral rights purchase cost (private)=	$1.28/cu yd
Estimated mineral rights purchase cost (commercial)=	$2.00/cu yd
Estimated aggregate purchase cost=	$6.00/cu yd
Estimated dredger tailing purchase+haul cost=	$4.80/cu yd
Estimated topsoil purchase cost=	$2.40/cu yd
Estimated off-site source transportation cost (<10 miles)=	$4.80/cu yd
Estimated equipment cost for local material moving=	$3.00/cu yd
Ton to cubic yard conversion=	1.6 t/cu yd
Width of non-haul road levee=	25 feet

PHASE 1 PROJECTS

7-11 REACH (River mile 37.7 to 40.3)

A: Construct setback levee

Length (ft)	Height of Levee (ft)	X section area (ft)	Volume (cu yd)	Material	Cost/cu yd	Material + trans cost	Equipment cost	TOTAL COST
350	12	708	9,178	Dredger	$4.80	$44,053	$27,533	$71,587
1,100	6	282	11,489	Dredger	$4.80	$55,147	$34,467	$89,613
7/11 CONTRIBUTION FOR BUILDING HAUL ROAD								-$85,000
								$76,200

B: Move Levee and revegetate

Length (ft)	Depth of cut (ft)	Width of levee cut and move	Volume (cu yd)	Equipment cost	TOTAL COST
3,000	8	25	22,222	$66,667	$66,667
7/11 CONTRIBUTION IN PLACE OF HARD POINTS AND COBBLE FACING					-$50,000
					$16,667

C: Extend rip-rap upstream of haul road bridge

CONSTRUCTED BY 7/11 MATERIALS

D: Construct fair weather crossing south of bridge

CONSTRUCTED BY 7/11 MATERIALS

M.J. RUDDY REACH (river mile 37.7 to 36.6)

E: Construct setback levee and floodplain, revegetate

	Height of	X section	Volume			Material +	Equipment	TOTAL

Phase 1

Permitting, field reconnaissance, and design	$190,000
Field staking, construction supervision	$76,000
Aggregate, topsoil, and other materials; Construction	$526,000
Riparian revegetation and bioengineering	$278,000
Project management and administration (3%)	$32,000
TOTAL PHASE 1 COST TO PUBLIC FUNDING SOURCES:	**$1,102,000**

Phase 2

Permitting, field reconnaissance, and design	$395,000
Field staking, construction supervision	$114,000
Aggregate, topsoil, and mineral rights/land purchase; Construction	$12,812,000
Riparian revegetation and bioengineering	$1,097,000
Monitoring	$150,000
Project management and administration (3%)	$434,000
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Estimated equipment cost for local material moving=	$3.00/cu yd
Ton to cubic yard conversion=	1.6 t/cu yd
Width of non-haul road levee=	25 feet

PHASE 1 PROJECTS

7-11 REACH (River mile 37.7 to 40.3)

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Length (ft)	Height of Levee (ft)	X section area (ft)	Volume (cu yd)	Material	Cost/cu yd	Material + trans cost	Equipment cost	TOTAL COST
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CONSTRUCTED BY 7/11 MATERIALS

D: Construct fair weather crossing south of bridge

CONSTRUCTED BY 7/11 MATERIALS

M.J. RUDDY REACH (river mile 37.7 to 36.6)

E: Construct setback levee and floodplain, revegetate

Height of	X section	Volume	Material +	Equipment	TOTAL

Length (ft)	Levee (ft)	area (ft)	(cu yd)	Material	Cost/cu yd	trans cost	cost	COST
640	26	2002	47,455	Dredger	$4.80	$227,783	$142,364	$370,148

LANDOWNER CONTRIBUTION TO REPAIR 11,000 CFS LEVEE

Length (ft)	Height of Levee (ft)	X section area (ft)	Volume (cu yd)	Material	Cost/cu yd	Material + trans cost	Equipment cost	
200	10	450	3,333	Dredger	$4.80	$16,000	$10,000	-$26,000

Area (sq ft)	Depth (ft)	Volume (cu yd)	Material	Cost/cu yd	Material + trans cost	Equipment cost	Revegetation cost	
17,000	12	7,556	Dredger	$4.80	$36,267	$22,667		$58,933
17,000	6	3,778	Topsoil/dredger	$4.80	$18,133	$11,333	$10,000	$39,467
								$442,548

F: Patch levees upstream of plant site

CONSTRUCTED BY SANTA FE AGGREGATES FOR LANDOWNER (UNDER CONSTRUCTION)

G: Patch levee downstream of haul road bridge

CONSTRUCTED BY SANTA FE AGGREGATES (COMPLETED)

WARNER/DEARDORFF REACH (river mile 36.6 to 35.2)

H: Patch levee at old conveyor bridge location and reconstruct 500 ft wide conveyor bridge

CONSTRUCTED BY SANTA FE AGGREGATES

I: Bioengineering and revegetation levee at old conveyor bridge location

Total length (ft)	Width of floodplain	Reveg cost	Equipment cost	Bioengineering length (ft)	Bioengineering cost	TOTAL COST
1,150	100 ft	$18,480	$20,000	1,150	$230,000	**$268,480**

REED REACH (River mile 35.2 to 34.3)

J. Patch entrance and exit to existing pond

CONSTRUCTED BY REED (UNDER 1603 PERMIT RESPONSIBILITIES)

PERMITTING	
Lead Agency staff or consultants	**$50,000**
FIELD RECONNAISSANCE	
Collect HEC-2 data for levee design (3 wks) + 2 wks misc topo data gathering	**$40,000**
DESIGN	
Lead Agency staff or consultants, run HEC-2 model, consult with aggregate miner engineers	**$100,000**
FIELD STAKING AND CONSTRUCTION SUPERVISION	
Lead Agency staff or consultants (1 person, 8 months)	**$76,120**

PROJECT MANAGEMENT AND ADMINISTRATION

Lead Agency $32,100

TOTAL PHASE 1 COSTS: $1,102,115

PHASE 2 PROJECTS

7-11 REACH (River mile 37.7 to 40.3)

A: Regrade and revegetate permitted dredger tailing area upstream of Roberts Ferry

Surface area (sq ft)	Reveg cost	Equipment cost	Regrading cost	TOTAL COST
561,400	$90,216	$20,000	CONSTRUCTED BY 7/11 MATERIALS	**$110,216**

B: Purchase mineral rights to dredger tailings upstream of Roberts Ferry Bridge (reveg cost in "A")

Volume (cu yd)	Material purchase	TOTAL COST
125,000	$160,000	**$160,000**

C: Conservation easement adjacent to Roberts Ferry Bridge, revegetate

Total area (acres)	Conservation easement	Revegetation cost	TOTAL COST
22.8	$45,689	$159,910	**$205,599**

D: Purchase mineral rights, construct floodplain, and revegetate

Area (sq ft)	Depth (ft)	Volume (cu yd)	Material	Phase 2B Cost/cu yd	Material + trans cost	Equipment cost	Revegetation cost	TOTAL COST
406,000	4	43,892	Dredger	$4.80	$210,681	$131,676		$342,357
406,000	6	65,838	Topsoil/dredger	$4.80	$316,022	$197,514	$65,243	$578,778

MINERAL RIGHTS	Volume (cu yd)	Material purchase	
	60,000	$120,000	$120,000

$1,041,135

E: *Grade north bank gravel bar upstream of haul road bridge*

Area (sq ft)	Vol generated (cu yd)	Equipment cost	TOTAL COST
164,400	5,000	$15,000	**$15,000**

F: Bioengineering and revegation on small floodplain

Total length (ft)	Width of floodplain	Reveg cost	Equipment cost	Bioengineering length (ft)	Bioengineering cost	TOTAL COST

3,100	25 ft	$12,454	$20,000	1,560	$312,000	**$344,454**

G: Construct setback levee through settling pond

Length (ft)	Height of Levee (ft)	X section area (ft)	Volume (cu yd)	Material	Cost/cu yd	Material + trans cost	Equipment cost	TOTAL COST
1500	12	588	32,667	Dredger	$4.80	$156,800	$98,000	**$254,800**

H: Construct floodplain in pond downstream of haul road bridge and revegetate

Area (sq ft)	Depth (ft)	Volume (cu yd)	Material	Cost/cu yd	Material + trans cost	Equipment cost	Revegetation cost	TOTAL COST
428,400	10	158,667	Dredger	$4.80	$761,600	$476,000		$1,237,600
428,400	6	95,200	Topsoil/dredger	$4.80	$456,960	$285,600	$68,843	$811,403

M.J. RUDDY REACH (river mile 37.7 to 36.6) **$2,049,003**

I: Reconstruct low water channel in 4-pumps site, bioengineering, revegetation

Estimated constr time	(assume 2 pieces at $1000/day each)	Equipment cost	Revegetation cost	Bioengineering length (ft)	Bioengineering cost	TOTAL COST
5 weeks		$50,000	$40,000	500	$100,000	**$190,000**

J: Construct south bank setback levee and floodplain upstream of haul road bridge with Phase 2-B material, revegetate

Length (ft)	Height of Levee (ft)	X section area (ft)	Volume (cu yd)	Material	Cost/cu yd	Material cost	Transp. cost	Equipment cost	TOTAL COST
1330	24	1752	86,302	Aggregate	$6.00	$517,813	$414,251		$932,064

Area (sq ft)	Depth (ft)	Volume (cu yd)	Material	Cost/cu yd	Material cost	Transp. cost	Equipment cost	Revegetation cost	
286,750	4.5	47,792	Phase 2-B dredger tailings	$0.00	$0	$229,400	$143,375		$372,775
286,750	3.5	37,171	Phase 2-B dredger tailings	$0.00	$0	$178,422	$111,514		$289,936
286,750	6	63,722	Topsoil	$2.40	$152,933	$305,867	$191,167	$46,080	$696,047
									$2,290,822

K: Construct north bank setback levee and floodplain upstream of haul road, revegetate

Length (ft)	Height of Levee (ft)	X section area (ft)	Volume (cu yd)	Material	Cost/cu yd	Material cost	Transp. cost	Equipment cost	TOTAL COST
1190	22	1518	66,904	Aggregate	$6.00	$401,427	$321,141	$200,713	$923,281

Area (sq ft)	Depth (ft)	Volume (cu yd)	Move Irrigation pump	Material	Cost/cu yd	Material cost	Transp. cost	Equipment cost	Revegetation cost	
120,000	8	35,556		Aggregate	$6.00	$213,333	$170,667	$106,667		$490,667
120,000	4	17,778	$10,000	Topsoil	$2.40	$42,667	$85,333	$53,333	$19,284	$210,617
										$1,624,565

L: Construct fair weather crossing on north side of bridge
CONSTRUCTED BY SANTA FE AGGREGATES

WARNER/DEARDORFF REACH (river mile 36.6 to 35.2)

M: Regrade and possible levee at aggregate storage area near plant site

Length (ft)	Height of Levee (ft)	X section area (ft)	Volume (cu yd)	Material	Cost/cu yd	Material cost	Transp. cost	Equipment cost	Revegetation cost	TOTAL COST
1,500	4	132	7,333	Aggregate	$6.00	$44,000	$35,200	$88,000	$24,105	**$191,305**

N: Mineral rights purchase in Warner Pond

Total area (sq ft)	Est depth of material (ft)	Volume of aggregate(cu yd)	Material	Material purchase	TOTAL COST
1,300,000	14	674,074	Aggregate	$862,815	**$862,815**

O: Construct setback levee and floodplain in Warner Pond, revegetate

Length (ft)	Height of Levee (ft)	X section area (ft)	Volume (cu yd)	Material	Equipment cost	TOTAL COST
2150	10	450	35,833	Aggregate	$107,500	$107,500

Excavated Area (sq ft)	Depth (ft)	Volume (cu yd)	Material	Equipment cost	Revegetation cost	
750,000	10	277,778	Aggregate	$833,333		$833,333
750,000	4	111,111	Topsoil	$333,333	$120,523	$453,857
Rough calculations show that excavated material is sufficient to create floodplain and levees						**$1,394,690**

P: Deardorff conservation easement and mineral right purchase

Minable area (ac)*	Tons per acre	Total area (acres)	Volume of purchase (cu yd)	Regrading volume (cu yd)	Mineral right cost	Equipment cost	Revegetation cost	TOTAL COST
20.0	50,000	26.1	1,306,818	64,667	$801,653	$73,905	$70,145	**$945,702**

** conservative estimate, probably near 15 acres with regulatory setbacks*

REED REACH (River mile 35.2 to 34.3)

Q: Aggregate purchase in and adjacent to Reed Pond

Purchase area (sq ft)	Purchase area (ac)*	Est depth of material (ft)	Volume of aggregate(cu yd)	Material	Material purchase	TOTAL COST
784,080	18	28	813,120	Aggregate	$1,626,240	$1,626,240
323,000	12	5	59,815	Aggregate	$119,630	$119,630
						$1,745,870

**Estimated from Reed County Use Permit Application and Reclamation Plan*
Rough calculations show that excavated material is sufficient to create floodplain and levees

R: Construct setback levee and floodplain through pond, revegetation

Length (ft)	Height of Levee (ft)	X section area (ft)	Volume (cu yd)	Material	Equipment cost		TOTAL COST
1420	10	450	23,667	Aggregate	$71,000		$71,000

Area (sq ft)	Depth (ft)	Volume (cu yd)	Material	Equipment cost	Revegetation cost	
240,000	10	88,889	Aggregate	$266,667		$266,667
240,000	4	35,556	Topsoil	$106,667	$38,567	$145,234
						$482,901

PERMITTING	
Lead Agency staff or consultants	**$75,000**
FIELD RECONNAISSANCE	
Topographical data gathering, gravel source search and surveying, vegetation search	**$70,000**
DESIGN	
Lead Agency staff or consultants, run HEC-2 model, consult with aggregate engineers	**$250,000**
FIELD STAKING AND CONSTRUCTION SUPERVISION	
Lead Agency staff or consultants (1 person, 12 months)	**$114,180**
MONITORING	
Lead Agency staff or consultants	**$150,000**
PROJECT MANAGEMENT AND ADMINISTRATION	
Lead Agency	**$432,542**

TOTAL PHASE 2 COSTS: $15,000,598

CONTINGENCY (10% of construction): $1,471,277

ESTIMATED TOTAL PHASE 1 AND PHASE 2 COSTS: $17,573,990

7–11 REACH

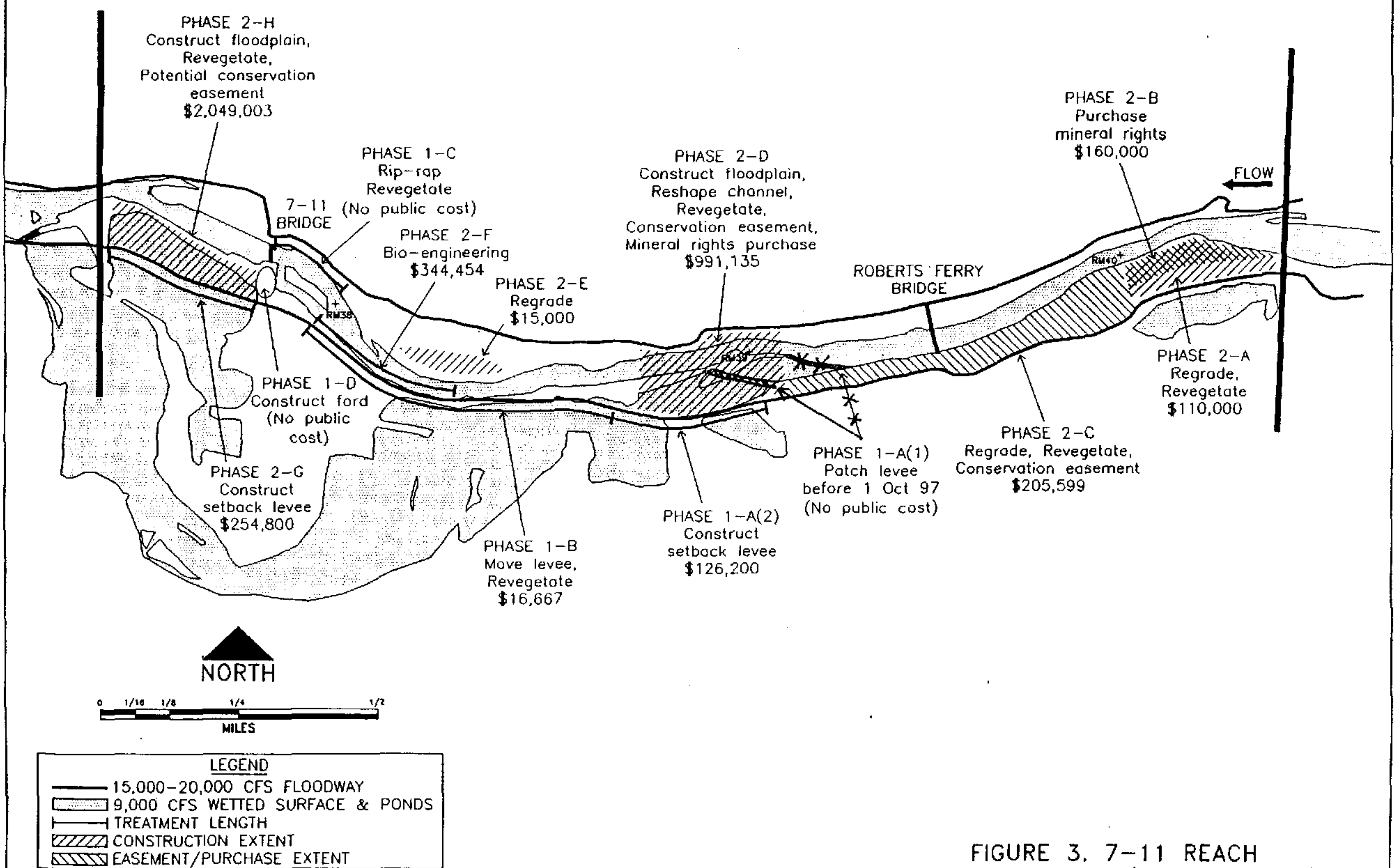


FIGURE 3. 7–11 REACH
TUOLUMNE RIVER (RM 37.6–40.3)
PROPOSED FLOODWAY HABITAT RESTORATION

McBain & Trush 1997

REV E

MJ RUDDY REACH

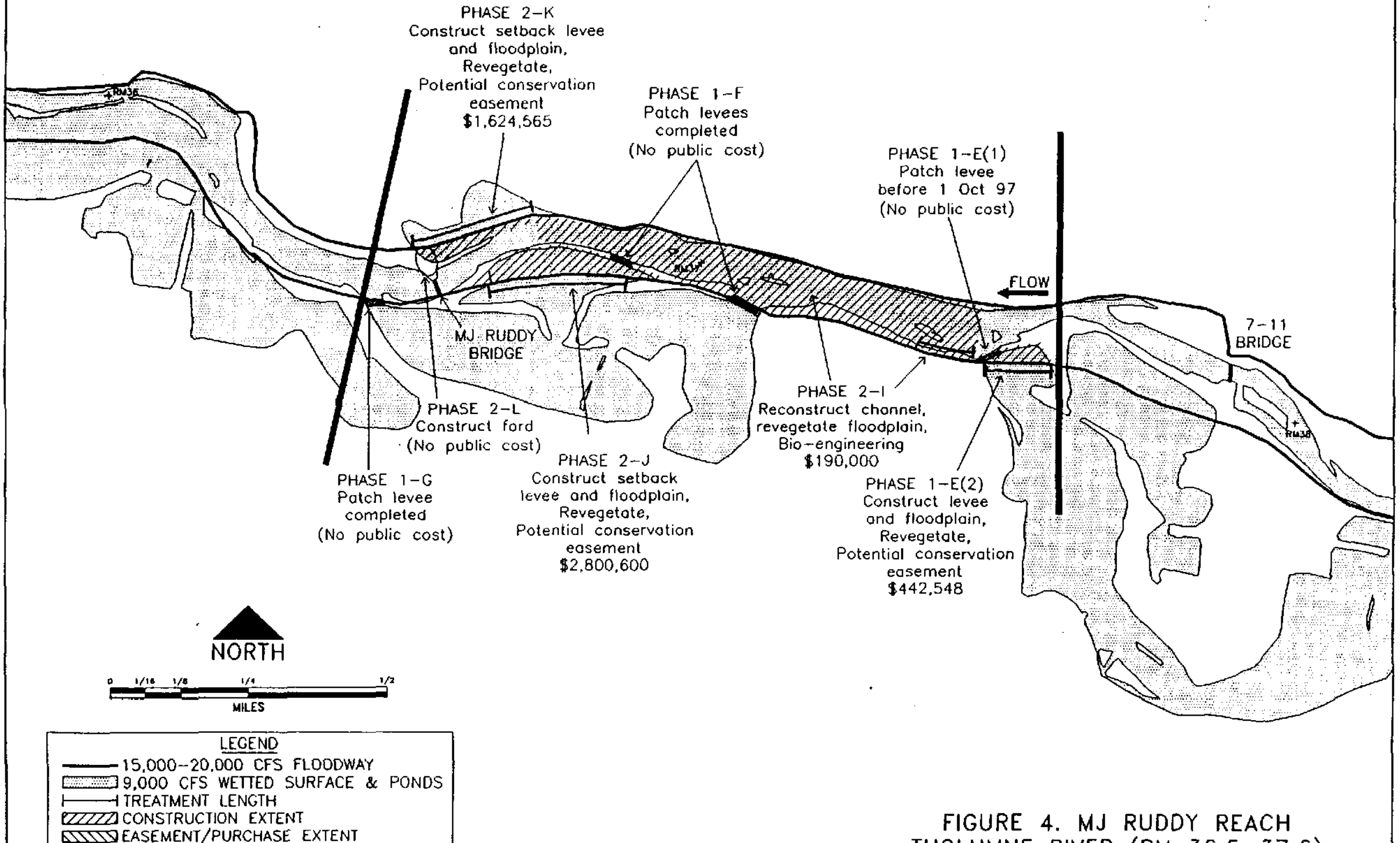


FIGURE 4. MJ RUDDY REACH
TUOLUMNE RIVER (RM 36.5-37.6)
PROPOSED FLOODWAY HABITAT RESTORATION

McBain & Trush 1997

REV E

WARNER / DEARDORFF REACH

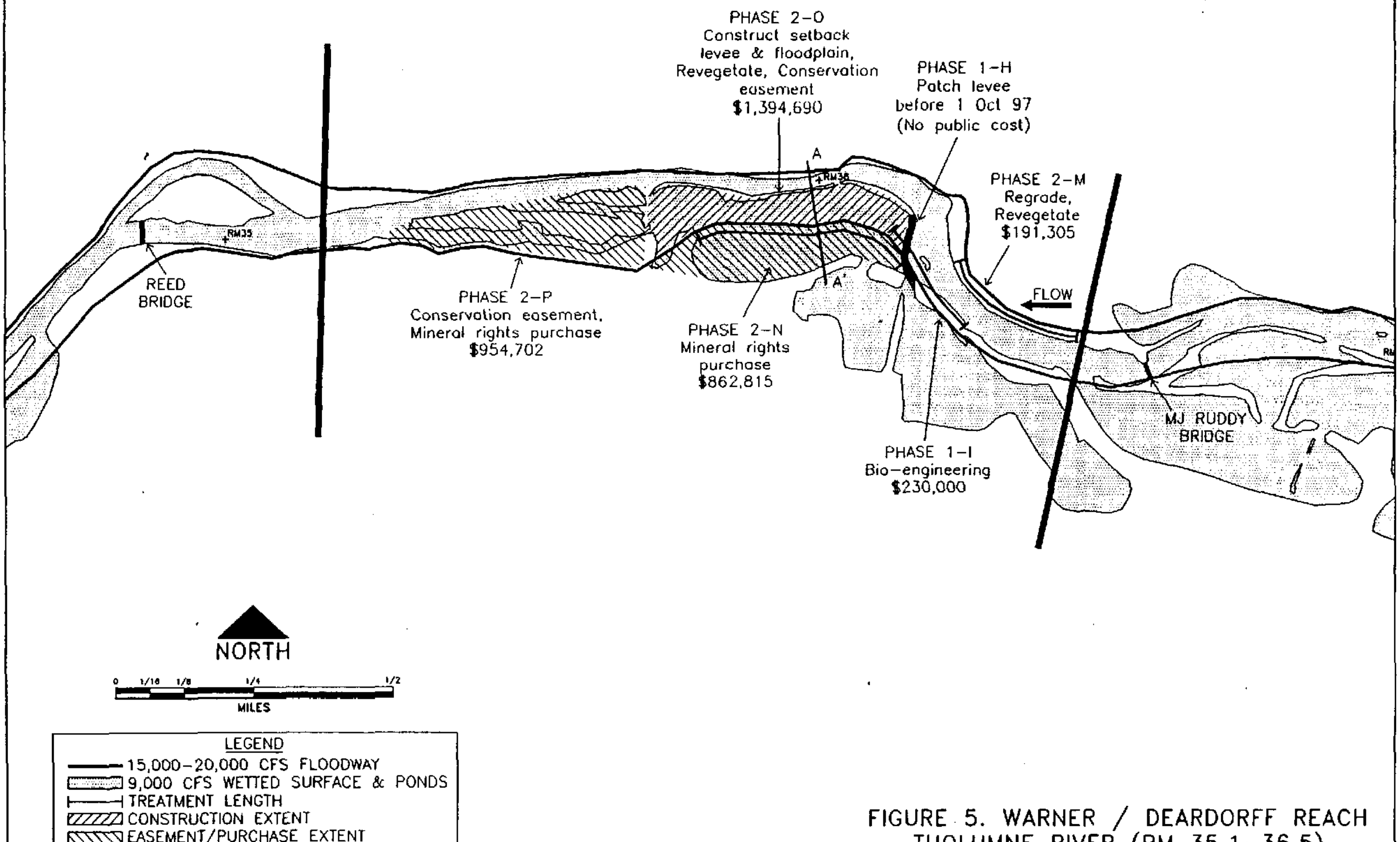


FIGURE 5. WARNER / DEARDORFF REACH
TUOLUMNE RIVER (RM 35.1-36.5)
PROPOSED FLOODWAY HABITAT RESTORATION

McBain & Trush 1997

REV E

REED REACH

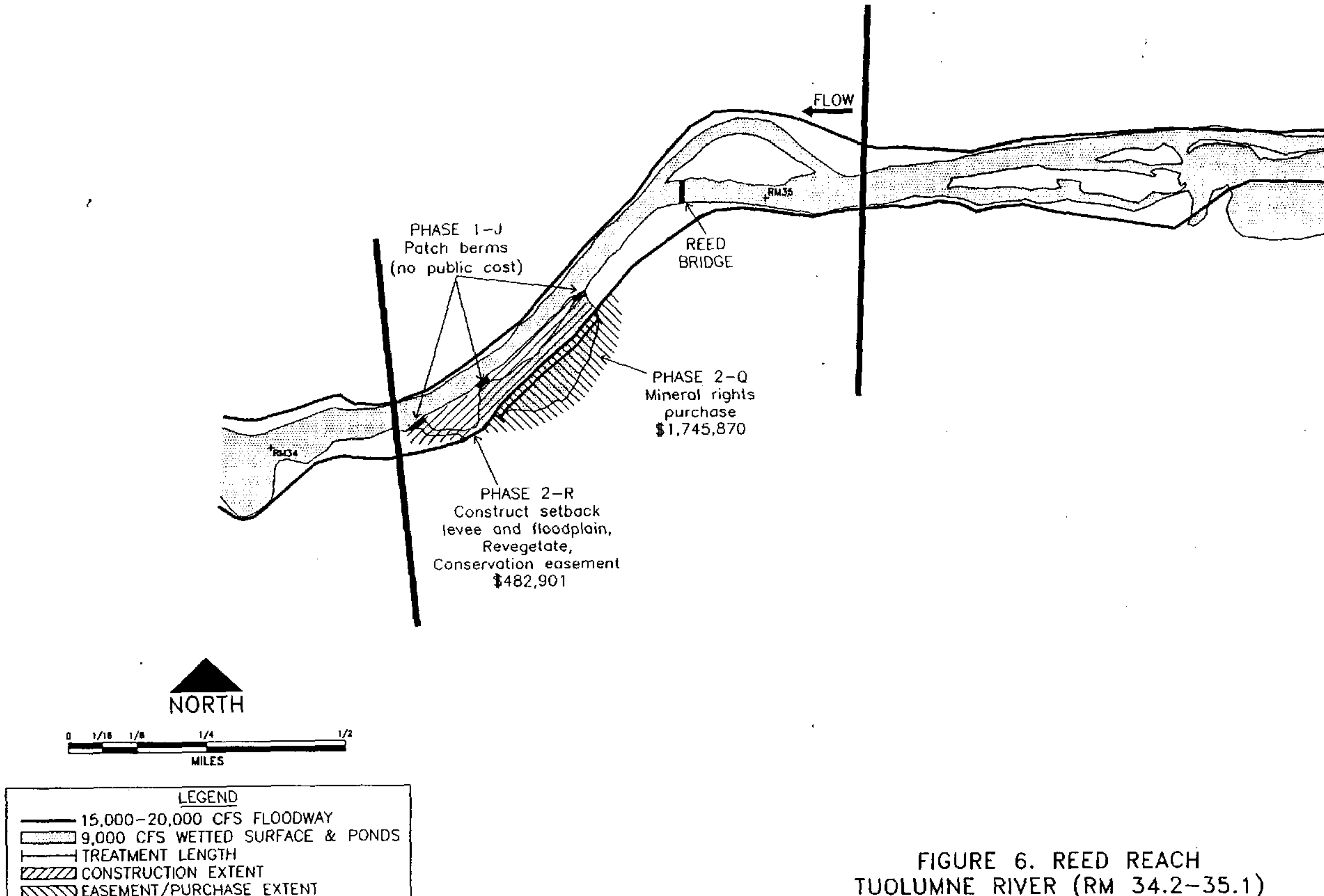


FIGURE 6. REED REACH
TUOLUMNE RIVER (RM 34.2-35.1)
PROPOSED FLOODWAY HABITAT RESTORATION

McBain & Trush 1997

REV E

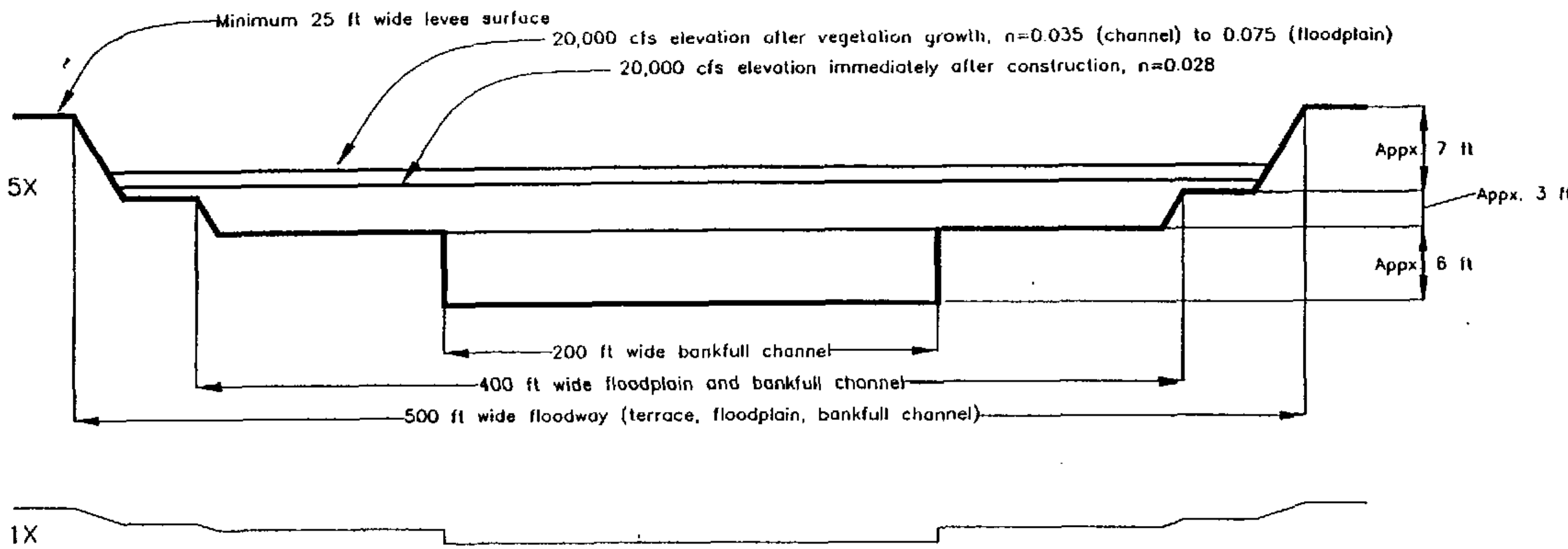


FIGURE 7. SIMPLIFIED FLOODWAY DESIGN TRANSECT

REV D

McBain & Trush 1997

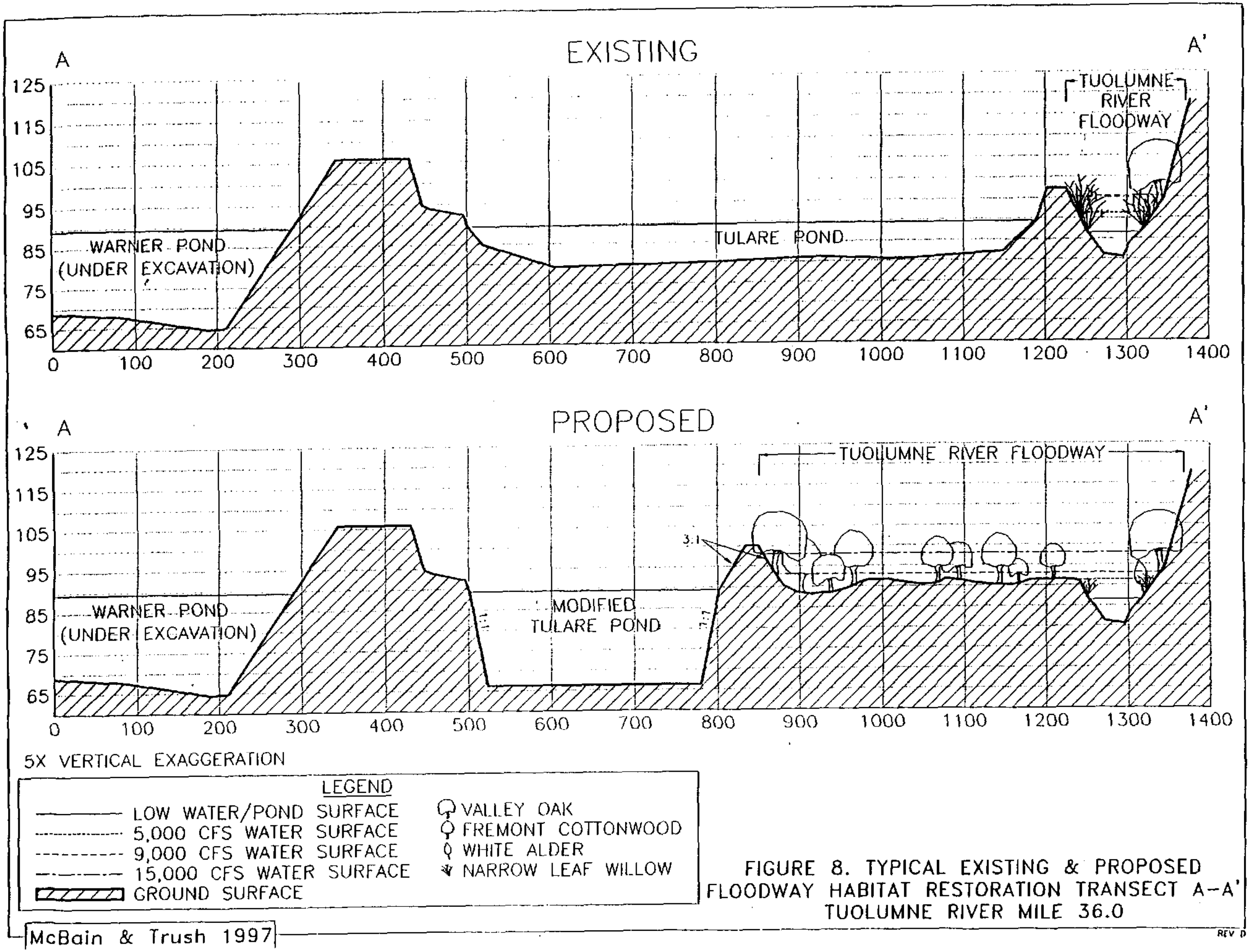
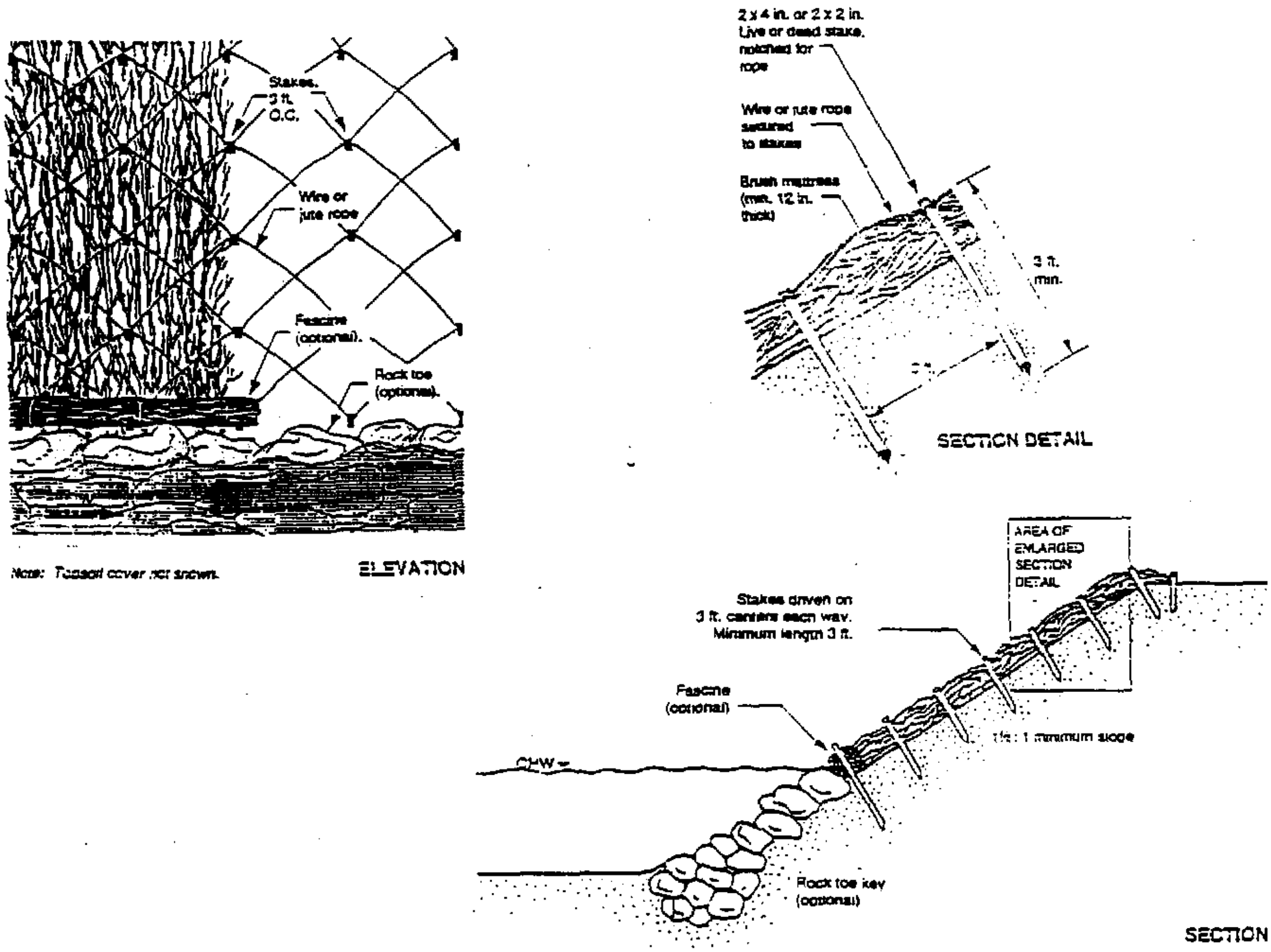


FIGURE 8. TYPICAL EXISTING & PROPOSED FLOODWAY HABITAT RESTORATION TRANSECT A–A' TUOLUMNE RIVER MILE 36.0

SALIX BRUSH MATTRESS

By King County Dept. of Public Works (1993), adapted from Gray & Leiser (1982)



SALIX/POPULUS JOINT PLANTING

By King County Dept. of Public Works (1993)

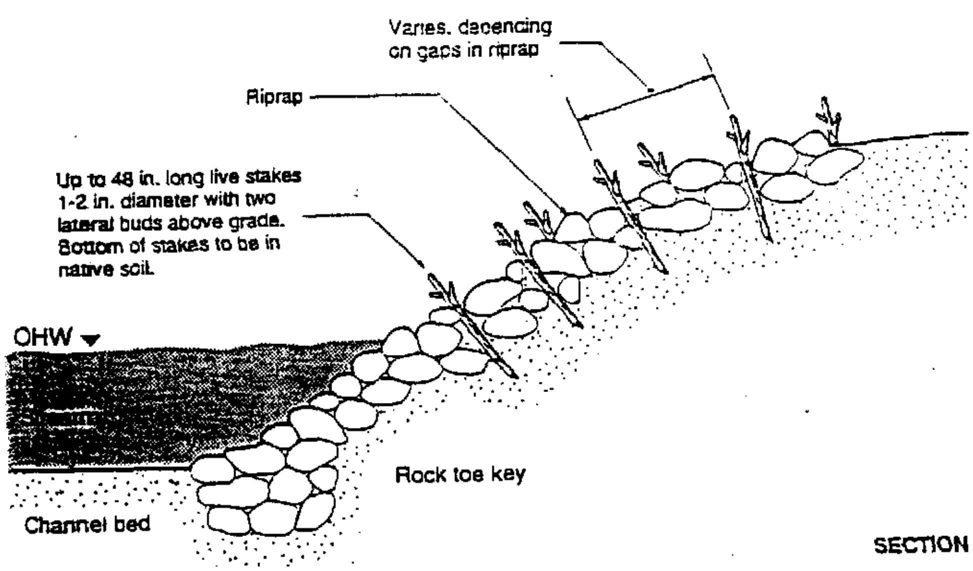


FIGURE 9. TYPICAL BIO-ENGINEERING STRATEGIES

McBain & Trush 1997

REV 0

Appendix 2

Mining Reach Monitoring Plan

Sections 1.0 and 3.0 from Attachment D of the draft project EA/IS dated 15 May 98

Attachment D
Draft Monitoring Plan

Anadromous Fish Restoration Program
Tuolumne River Riparian Zone Improvements

Gravel Mining Reach & Special Run Pools 9/10 Restoration and Mitigation Projects

Sacramento Field Office
United States Fish and Wildlife Service
Sacramento, California

Turlock Irrigation District
Turlock, California

May 15, 1998

CONTENTS

1.0 PURPOSE 1

2.0 SRP 9 AND SRP 10 4
- 2.1 Fluvial Geomorphic Processes 4
  - 2.1.1 Project Performance Topography 4
  - 2.1.2 Channel Adjustment 6
- 2.2 Fisheries Resources 6
  - 2.2.1 Juvenile Salmonid Survival Estimates 7
  - 2.2.2 Bass Abundance 7
  - 2.2.3 Bass and Salmonid Habitat Availability 8
- 2.3 Riparian Resources 9
  - 2.3.1 Project Performance 9
- 2.4 Wetlands 10
  - 2.4.1 Jurisdictional Wetlands 10
- 2.5 Threatened And Endangered Species 10
  - 2.5.1 Plants 10
  - 2.5.2 Animals 10
- 2.6 Transportation/Circulation 11
  - 2.6.1 Items to be Addressed in Construction Traffic Control Plan 11
- 2.7 Air Quality 12
  - 2.7.1 Short-term Construction Fugitive Dust Emissions 12
  - 2.7.2 Short-term Construction Equipment Exhaust Emissions 13
- 2.8 Noise 13
  - 2.8.1 Short-term Construction Generated Noise Impacts 14
- 2.9 Cultural Resources 14
  - 2.9.1 Subsurface Archaeological Deposits and Human Burials Remains 14

3.0 GRAVEL MINING REACH 16
- 3.1 Fluvial Geomorphic Processes 17
  - 3.1.1 Project Performance 17
  - 3.1.2 Channel Adjustment 18
- 3.2 Fisheries Resources 19
  - 3.2.1 Salmonid and Bass Habitat Availability 20
- 3.3 Riparian Resources 20
  - 3.3.1 Project Performance 21
- 3.4 Wetlands 22
- 3.5 Threatened and Endangered Species 22
- 3.6 Transportation/Circulation 22
- 3.7 Air Quality 22
- 3.8 Noise 22
- 3.9 Aggregate Resources 22
  - 3.9.1 Blanket Permit Process & Components 22
- 3.10 Cultural Resources 24
  - 3.10.1 Subsurface Archaeological Deposits and Human Burials Remains 24

4.0 LA GRANGE RESERVOIR SOURCE MATERIAL SITE 26
4.1 Fisheries Resources 26
4.2 Wetlands 26
4.2.1 Jurisdictional Wetlands 26
4.3 Threatened and Endangered Species 26
4.3.1 Plants 26
4.3.2 Animals 27
4.4 Air Quality 27
4.5 Cultural Resources 27

Table

1 Monitoring Schedule Based on a Sequence of Hypothesized Peak Flows and Tentative Construction Implementation Schedule 3

1.0 PURPOSE

This Monitoring Plan describes methods to evaluate the SRP 9, SRP 10, and Gravel Mining Reach restoration and mitigation projects on the Tuolumne River. The Plan recommends monitoring objectives and proposes field techniques, data management and analysis protocols, budget and funding needs, and an example timeline for implementing the Monitoring Plan. The Plan is a culmination of ideas and efforts originally formulated by the Monitoring Subcommittee of the Tuolumne River Technical Advisory Committee (TRTAC) and is provided to accompany the EA/IS and permit applications for the restoration and mitigation projects. Several important issues were considered when selecting the proposed monitoring protocols, including: 1) how to interpret the effectiveness of specific restoration actions; 2) appropriate target species and life stages capable of elucidating expected population responses; 3) integrating project-specific monitoring proposals into existing river-wide programs or other requirements with similar objectives or methods; 4) specific requirements of environmental permits and mitigation monitoring; and 5) funding source requirements.

The Monitoring Plan is designed to evaluate two important aspects of the restoration and mitigation projects: first, to test whether stated project objectives have been met, and to guide future restoration design (project performance), and second, to evaluate success of the mitigation measures (mitigation success) and reduce significant impacts of the projects. Project performance monitoring is organized into resource issues as discussed in the accompanying EA/IS. Where possible, the restoration objectives and associated hypotheses for each section were stated with enough specificity that they could be related to the proposed monitoring objectives. Because some of the hypothesized benefits of the restoration and mitigation projects are predicated on assumptions of salmonid limiting factors (e.g., bass predation), testing specific hypotheses in the monitoring phase of these projects is proposed. Using a hypothesis-based approach for some aspects of the monitoring program, information that will guide future project design and selection (adaptive management) will be generated.

The Monitoring Plan attempts to meet CEQA/NEPA requirements, and integrate with the FERC Settlement Agreement (FSA), the CVPIA-AFRP and Comprehensive Assessment and Monitoring Program (CAMP), and the CALFED program. Monitoring data will be collected and analyzed according to standardized techniques and stored in a common database. The data will be reviewed by technical personnel and published annually in reports submitted to resource and funding agencies, and will emphasize data interpretation and adaptive recommendations. Because some of the monitoring approaches are considered experimental, modification of technique or approach may occur after the first year, especially for some of the fisheries approaches that are proposed.

The restoration and mitigation projects are scheduled for implementation over several years, beginning in summer of 1998 and continuing through 2002 (assuming all future funding needs are provided). The Monitoring Plan assumes implementation of the projects will follow the proposed schedule, but can be adapted to changes in the implementation schedule. Because the reconstructed channel morphology may respond to high discharge events by adjusting channel dimensions, several geomorphic monitoring protocols are triggered by exceedence of discharge thresholds. Field experience in 1987-1992 on the Tuolumne River showed that geomorphic monitoring during drought years (or years without significant flow events) is unnecessary, as limited useful data are collected. Therefore, geomorphic monitoring is designed to evaluate up to three peak flow events, preferably within three different discharge ranges, as a way to guarantee that meaningful data will be collected. The threshold discharge corresponds to the design bankfull discharge, initially assumed at 5,000 cfs. This discharge may occur in any given year, so to illustrate a potential monitoring schedule, an example annual peak discharge has been assigned to each future year, and then monitoring responses were linked to these threshold events. For example, in 2003 the hypothesized peak discharge of 10,400 cfs follows two dry years and triggers numerous geomorphic monitoring elements, but these elements will have been monitored in previous years if peak discharge exceeds the threshold. The third example threshold event occurs in 2005, so budget outlays and scheduling timelines for geomorphic monitoring are projected through 2005, but would be prolonged beyond 2005 in the absence of threshold-exceeding flows. Revegetated riparian zones will be monitored for 5 years following each construction phase. There is no guarantee, however, that desired flow events will occur as hypothesized in this Monitoring Plan. No artificial flow releases will be made to create conditions for such monitoring. **Table 1** shows the assumed schedule for proposed project implementation, and the proposed monitoring components for each year for geomorphology, fisheries, and riparian issues.

Annual funding requirements were estimated by determining the monitoring required after each example water year, and then estimating time and expenses to conduct that monitoring. The budget allocates funding based on the assumption that all monitoring components would be implemented, but not necessarily in the example year. While wet years require more funds than dry years due to additional monitoring tasks, the average annual cost estimated through 2007 is approximately $102,000 per year. Budget estimates are based on prevailing labor rates, and time estimates based on our monitoring experience on similar projects, and assume no inflation. Costs for each monitoring component were estimated independent of other activities, but would be reduced by coordinating monitoring activities (for example, monitoring geomorphic and riparian cross sections together, etc).

Table 2. Estimated costs associated with the hypothesized monitoring schedule. The budget assumes all monitoring components are implemented as described in the schedule.

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	TOTAL
SRP 9 and 10											
Geomorphic Processes	$1,563	$3,480	$20,880	$0	$0	$19,530	$15,610	$3,920	$0	$0	$64,983
Fisheries Resources	$75,670	$56,415	$58,515	$51,060	$4,200	$2,100	$0	$0	$0	$0	$247,960
Riparian Resources	$0	$8,145	$0	$16,290	$8,145	$8,145	$16,290	$0	$8,145	$0	$65,160
SRP 9 AND 10 SUBTOTAL	$77,233	$68,040	$79,395	$67,350	$12,345	$29,775	$31,900	$3,920	$8,145	$0	$378,103
GRAVEL MINING REACH											
Geomorphic Processes	$1,563	$6,690	$31,815	$8,000	$8,655	$107,225	$71,065	$53,525	$0	$0	$288,538
Fisheries Resources	$5,355	$14,910	$17,010	$19,110	$18,960	$9,405	$4,200	$2,100	$0	$0	$91,050
Riparian Resources	$0	$9,625	$11,805	$18,900	$27,875	$21,570	$22,170	$29,755	$10,415	$9,625	$161,740
MINING REACH SUBTOTAL	$6,918	$31,225	$60,630	$46,010	$55,490	$138,200	$97,435	$85,380	$10,415	$9,625	$541,328
ANNUAL REPORT:	$8,415	$9,927	$14,003	$11,336	$6,784	$16,798	$12,934	$8,930	$1,856	$963	$91,943
ANNUAL BUDGET TOTAL	$92,565	$109,192	$154,028	$124,696	$74,619	$184,773	$142,269	$98,230	$20,416	$10,588	$1,011,373
GRAND TOTAL:	**$1,011,373**										
YEARLY AVERAGE:	**$101,137**										

Table 1. Monitoring schedule based on a sequence of hypothesized peak flows, to illustrate the proposed monitoring scheme.

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Hypothetical annual peak discharge		*Q=3650cfs*	*Q=7280cfs*	*Q=2980cfs*	*Q=1200cfs*	*Q=10400cfs*	*Q=8010cfs*	*Q=6870cfs*		
CONSTRUCTION										
SRP 9 and 10	SRP 9	[illegible]	[illegible]							
GRAVEL MINING REACH	[illegible]	PHASE III	[illegible]	PHASE IV						
MONITORING										
SRP 9										
GEOMORPHOLOGY	pb	ab,rx		rx, n, xs, thal		rx*, xs, thal	xs	xs, thal		
FISHERIES	ef, sv, map	ef, sv, map, sss	ef, sv, sss	ef, sv, sss	sss	sss	sss	sss#		
RIPARIAN		ab, pp, $	$	pp		pp		pp		
SRP 10										
GEOMORPHOLOGY		pb		ab, rx, xs, thal		rx*, xs, thal	xs	xs, thal		
FISHERIES	ef, sv, map	ef, sv	ef, sv, sss	ef, sv, map, sss	sss	sss	sss	sss#		
RIPARIAN				ab, pp, $	$	pp		pp		pp
GRAVEL MINING REACH PHASE I										
GEOMORPHOLOGY	pb	ab,rx		n, rx, xs, thal		rx*, xs, thal	xs, thal	xs, thal		
FISHERIES	map	map, sss	sss	sss	sss	sss	sss	sss#		
RIPARIAN		ab, pp, $	bio, $	pp	pp	bio		pp, bio		
GRAVEL MINING REACH PHASE II										
GEOMORPHOLOGY	pb			ab, n, rx, thal		rx*, xs, thal	xs, thal	xs, thal		
FISHERIES		map	map, sss	sss	sss	sss	sss	sss#		
RIPARIAN			ab, pp, bio, $	$	pp	pp, bio	bio		pp, bio	
GRAVEL MINING REACH PHASE III										
GEOMORPHOLOGY	pb			ab, rx, thal		rx*, n, xs, thal	xs, thal	xs, thal		
FISHERIES			map	map, sss	sss	sss	sss	sss#		
RIPARIAN				ab, pp, $	$	pp, bio	pp, bio	bio		pp
GRAVEL MINING REACH PHASE IV										
GEOMORPHOLOGY			pb		ab, rx	rx*, xs, thal	n, xs, thal	xs, thal		
FISHERIES				map	map, sss	sss	sss	sss#		
RIPARIAN					ab, pp, $	$	pp	pp		pp
ANNUAL BUDGET:	$92,565	$109,192	$154,028	$124,696	$74,619	$184,773	$142,269	$98,230	$20,416	$10,588

Geomorphology symbols: pb=pre-built channel topography; ab=as-built channel topography; n=manning's "n"hydraulic calculation; rx= bed mobility with tracer rocks; thal= channel vertical adjustment w
xs= channel planform adjustment with cross-section profiles; *=bed mobility observed;

Fisheries symbols: ef=bass abundance by electrofishing; sv=smolt survival estimate; map=habitat mapping; sss=annual spawning and seining surveys; # denotes that spawning surveys will occur annu

Riparian symbols: pb=pre-built vegetation; ab=as-built vegetation; pp=project performance plots; bio=bioengineered bank protection; $=last year of irrigation

3.0 GRAVEL MINING REACH

Off-channel mining for aggregate on the Tuolumne River began in the 1950's, and is presently concentrated into a six mile river reach (RM 40.3 to 34.3) referred to as the Gravel Mining Reach. Agricultural encroachment and aggregate mining in this reach have reduced the floodway capacity, and the reach represents a potential bottleneck to river ecosystem and chinook salmon recovery. Mining activity has changed the natural channel morphology and physical processes, reduced floodway capacity by narrowing the channel with dikes and berms that are subject to frequent and costly failures from minor flood events, and eliminated extensive areas of floodplain and terrace riparian habitat. In addition, mining has created extensive lentic aquatic habitat in off-channel ponded pits, which are occasionally "captured" by the main channel when dikes fail (as in the January 1997 flooding). These ponds harbor non-native predator species, particularly bass, and subject juvenile chinook salmon to high in-river mortality. The project proposes to restore a riparian floodway by rebuilding and setting back dikes to increase floodway width to 500 ft minimum, and safely convey discharge of up to 15,000 cfs. Increased width and flood capacity should significantly reduce risks of dike failure, thus protecting human resources (structures and mining operations). Restoration will also reduce mortality to chinook salmon by reducing exposure to predation in captured off-channel pits. The project also proposes to restore native riparian communities on rebuilt floodplains and terraces. In addition, a principle objective of restoring this reach is to improve chinook spawning and rearing habitats. Specifically, the objectives of the Gravel Mining Reach project as stated in the conceptual design are:

- Improve salmonid spawning and rearing habitats by restoring an alternate bar (pool-riffle) morphology, and filling in-channel mining pits
- Reduce the potential for future production losses of juvenile salmon by preventing future connection between the Tuolumne River mainstem and off-channel mining pits
- Restore native riparian communities on appropriate geomorphic surfaces (i.e., active channel, floodplains, terraces) within the restored floodway
- Restore habitats for special status species (e.g., egrets, ospreys, herons)
- Restore a floodway width that will safely convey floods of 15,000 cfs
- Establish migratory corridor within the restored floodway to improve and maintain riparian and salmonid habitat
- Remove floodway "bottleneck" created by inadequate dikes (i.e., prevent dike failure above a certain discharge threshold)
- Protect aggregate extraction operations, bridges, and other human structures from future flood damage

Due to the large scale of the Gravel Mining Reach project, implementation of channel and riparian restoration will occur in four phases beginning in 1998, and follow the proposed completion dates outlined below:

- Phase I (7/11) to be completed by May 1999
- Phase II (MJ Ruddy) to be completed by May 2000
- Phase III (Warner/Deardorff) to be completed by May 2001
- Phase IV (Reed) to be completed by May 2002

The project objectives emphasize restoring the floodway and riparian zones and isolating the off-channel pits, and requires that monitoring prioritize geomorphologic and riparian components. The monitoring period will extend through 2007. Most monitoring will occur immediately after threshold hydrologic events (e.g., whenever floods exceed 5,000 cfs).

3.1 Fluvial Geomorphic Processes

Fluvial geomorphic objectives of the project are to create a functional floodway that safely conveys flows of at least 15,000 cfs, create functional floodplains that begin to inundate at design bankfull discharges, establish a channel migratory corridor, restore the alternate bar (pool-riffle) morphology, and restore bedload continuity. Specific monitoring objectives related to geomorphic processes are:

- document channel adjustment after construction
- document success of hydraulic design variables
- document channel dynamics as a function of discharge (e.g., bedload mobility and routing).

As with the SRP 9 and 10 projects, the monitoring schedule is built upon threshold flow events triggering specific monitoring actions. The threshold flow is initially assumed at 5,000 cfs. Channel morphology will be monitored prior to construction, and then again immediately after construction, to document as-built conditions. Subsequent monitoring will occur after a maximum of three threshold high flow events. We propose three target discharge ranges: 4,000 to 7,000 cfs, 7,000 to 10,000 cfs, and 10,000 to 15,000 cfs, and suggest that geomorphic monitoring evaluate a flow event in each of these classes if possible, for a maximum of three monitoring sequences. Flows exceeding 9,000 cfs are contingent upon Army Corp of Engineers issuing a variance in discharge limits, currently set at 9,000 cfs at Ninth Street, Modesto. More detailed descriptions of the proposed monitoring schedule is provided in the following sections.

3.1.1 Project Performance

Topography

As with the SRP 9 and SRP 10 designs, the project design phase in the Gravel Mining Reach will develop a topographic map (digital terrain model) of the site immediately prior to construction. Cross sections will be established at locations appropriate for future channel morphology monitoring. A digital terrain model depicting the design channel will then be developed and used to construct the project. Immediately after each phase of construction is completed, another topographic map will be surveyed to document as-built conditions (compares as-built topography to design topography for contractual sign-off). The as-built topography will then serve as the basis for comparing subsequent channel adjustment (see Section 3.1.2). Bed surface particle size distribution will be documented at two selected riffles immediately after each construction phase for later comparison of particle size adjustment resulting from high flow events.

Schedule: Topographic maps will be surveyed immediately after completing each construction phase (Winter 1998 for Phase I, Winter 1999 for Phase II, Winter 2000 for Phase III, and Winter 2001 for Phase IV).

Hydraulics

Because floodway conveyance is a primary objective of the Gravel Mining Reach project, hydraulic floodway computations and geomorphic surface design (floodplains and terraces) are of primary importance. During a 5,400 cfs flow in 1996, hydraulic variables at the M.J. Ruddy Restoration Project (Delta Pumps) channel restoration project showed that as-built Manning's n values were consistently between 0.028 and 0.029 based on HEC-RAS water surface profile modeling. By monitoring water surface elevations during discreet high flow events immediately after construction, we can re-evaluate roughness values using HEC-RAS, improving our estimates for later phases of construction. Because the period in which riparian vegetation will begin to significantly increase Manning's n will be in excess of five years, the change in roughness as vegetation matures will not be included in this Monitoring Plan.

Floodplains and terraces will be constructed at elevations inundated at designed discharges. Their proper inundat 'scharge is dependent on channel geometry, energy, slope, and Manning's n values. As part of the wat. 'ace elevation monitoring, elevations will be marked on the monitoring cross sections to evaluate dplain and terrace inundation at the appropriate discharges, and hydraulic explanations can be providea .or sites where inundation objectives are not met.

Schedule: Water surface elevations will be monitored during the first high flow after construction that equals or exceeds the design bankfull discharge. One flow event monitored.

Bed Mobility at Design Bankfull Discharge

A fundamental characteristic of properly functioning alluvial rivers is the initiation of bed surface mobility and bedload transport of the larger particle clasts at streamflows approaching bankfull discharge. Bedload movement through the system thus depends on flows near or exceeding the design bankfull discharge to at least transport bedload through a riffle-pool-riffle sequence. Bed mobility will be monitored by placing painted tracer rocks on two riffle cross sections in each phase of the Gravel Mining Reach project. The tracer gravels, representing the D84 and D50 particle sizes, will be monitored for mobility threshold and travel distance (i.e., are the particles moving, and if so, are they moving through pools and onto the next downstream riffle). For each construction phase the marked rock experiments will be in place until a discharge just large enough to initiate movement is observed. This discharge will then be compared to the design bankfull discharge, to evaluate bed surface mobility objectives. Once the tracer rocks are mobilized, their deposition location will be mapped to document travel distance, and left to monitor future movement through pools and riffles.

Surface pebble counts and subsurface bulk samples will be collected on each monitoring riffle to document particle size distributions and to track adjustments over time. Water surface elevation and slopes will be measured at monitoring riffles to estimate the hydraulic variables of the discharge that mobilizes the bed.

Schedule: Tracer rocks will be installed immediately after construction of each phase, and monitored after each high flow event until mobility is observed. Once mobility has occurred, marked rocks will continue to be monitored to observe future movement through 2005 to evaluate the extent of coarse bedload routing through pool-riffle sequences. Some periodic maintenance will be required over time (i.e., repainting tracer rocks that fade, periodically checking for movement). Up to three flow events monitored.

3.1.2 Channel Adjustment

Channel Migration/Planform Adjustment

The primary hydraulic objective of the Gravel Mining Reach project is to improve floodway conveyance and reduce risk and damage resulting from channel migration and berm failure. However, channel migration provides important geomorphic, biological, and riparian benefits to the system. Hence, monitoring channel migration and planform evolution are crucial components of monitoring. Small-scale planform adjustment will be documented by level surveys of cross sections placed at locations susceptible to lateral movement (apex of meanders). Large-scale planform adjustments will be documented by a combination of cross section evaluation and low-altitude aerial photographs (1"=500' or better contact print). Cross sections established during the pre-and post-construction topographic surveys will be re-surveyed with engineers levels and tapes to provide precise documentation of channel adjustment. Cross section monitoring will be conducted during all construction phases.

Schedule: Monitoring will occur immediately after each high flow event that exceeds a threshold that begins to cause channel adjustment (initial target > 5,000 cfs). Monitoring channel migration after each threshold high flow event will be needed to evaluate whether project maintenance is required to further protect human structures adjacent to the floodway. Up to two flow events monitored.

Channel Degradation/Aggradation

Vertical adjustment for both inner channel (bed aggradation/degradation) and floodplain (fine sediment deposition) will be documented at specific locations by surveying cross sections at apex of meanders (pools) and at meander crossovers (riffles). A thalweg profile surveyed through all phases with an engineers level or total station will document changes to the bed elevation and pool/riffle sequencing (e.g., are pools filling, riffles steepening, or readjusting longitudinally).

Schedule: Monitoring will occur immediately after the each of three high flow events that exceeds a threshold that begins to cause channel adjustment (initial target > 5,000 cfs). Up to two flow events monitored.

Dike Inspection/Maintenance

The TID will develop and implement a Dike Maintenance and Operation Plan (DMOP) which covers all dikes constructed as part of the proposed project. The DMOP will specify on-going dike inspection and maintenance procedures conducted by TID, and will also discuss the relationship between these procedures and the State Department of Conservation, Office of Mine Reclamation's requirement for the preparation of annual mine inspection reports. The specified procedures in the DMOP will include inspection of the dikes in conjunction with the evaluation of bioengineered structures. In addition, a long-term dike inspection schedule will be presented which requires inspection of the dikes on a frequency of not less than once every five years and after threshold high-flow events (initial target > 10,000 cfs). Areas of dike erosion or breaches identified during the inspections will be repaired and revegetated in a manner consistent with the initial restoration plan.

Schedule: The Dike Maintenance and Operation Plan will be developed prior to the completion of project construction and submitted to the Stanislaus County Planning Department for review. The DMOP would be implemented throughout the life of the project.

3.2 FISHERIES RESOURCES

The six mile long Gravel Mining Reach contains large off-channel pits that negatively impact chinook salmon by stranding juveniles in ponds during high flow events and harboring predator species, notably non-native bass. Additionally, chinook spawning and rearing habitat is either absent or severely degraded. Restoring these reaches will reverse past trends of habitat degradation. Specific objectives of the Gravel Mining Reach restoration project related to fisheries resources include: (1) improving salmonid spawning and rearing habitats by restoring an alternate-bar morphology, (2) restoring spawning habitat within the meandering channel, (3) improving juvenile salmonid survival by preventing future connection between the Tuolumne River and off-channel mining pits (that contain introduced predator species).

In general, biological monitoring protocols will focus on:

- quantifying changes in habitat availability
- documenting habitat use by rearing juveniles and spawning adults
- document potential improvements in juvenile survival in the Gravel Mining Reach by evaluating on-going river-wide survival monitoring
- coordinating with the river-wide monitoring program to establish a reach-specific index of smolt survival pre, during, and post construction of all restoration phases.

3.2.1 Salmonid and Bass Habitat Availability

The fisheries study plan will quantifying habitat availability and changes in pre-and post-restoration conditions by field mapping habitat areas onto aerial photographs. Maps showing physical habitat boundaries of pools, riffles, runs, SRPs and backwater areas will be produced from aerial photos, and will provide the physical backdrop for delineation of habitat boundaries for fish species of interest, such as chinook salmon and bass. Identifying habitat boundaries will be based on specified criteria for species habitat preferences, and will focus on predator species spawning and rearing habitat in addition to salmonid habitat preferences. These criteria will include variables such as depth and velocity preferences for each species, determined according to site-specific information when available, or otherwise will refer to published literature values of habitat preferences. A full set of criteria will be defined for each species of interest prior to field mapping. High resolution aerial photographs available from the project construction activities (1"=2,000 ft or better) will provide field templates for mapping habitat boundaries. These maps offer the flexibility of later incorporating habitat boundaries for other fish species, amphibians, migratory birds, etc. Data will be digitized for comparing habitat areas before and after construction, and presented in planform color format. Additional layers incorporating information about particle sizes of sorted bed surface materials can also be added (qualitative facies maps) to quantify changes in physical habitat complexity. Where possible, we recommend quantifying physical habitat boundaries in reference to a common denominator such as alternate bar sequences, which are repeatable geomorphic features that can be treated statistically and compared to other river reaches. Once construction is completed, the habitat maps will be available for monitoring long-term changes (succession) of habitat quantity, quality and use.

Field mapping can also address the added benefits incurred by preventing reconnection of off-channel pits/ponds that remain outside the reconstructed setback levees. These ponded pits will be mapped onto the aerial photos and digitized to quantify the post-construction surface area of isolated ponds altered by project construction.

Verification of habitat use by various life stages of fish species will provide important information for evaluating the success of project objectives. We will employ direct observation or seining during field mapping to establish the presence of juvenile salmonids and bass. Additionally, seining similar to that currently conducted by the Districts will be used for four years after each construction phase to assess habitat use by rearing salmonids in each project reach. A stratified sampling design, in conjunction with the phased implementation for this section of river, should help to address differences in habitat use by salmon in restored (treatment) and yet-to-be restored (control) segments within the Mining Reach. CDFG will also extend seasonal spawning surveys to newly created spawning habitat within the project boundaries. Two field days will be provided for CDFG personnel for field calibration of redd counts to spawner surveys.

Schedule: Pre-construction habitat maps will be prepared for all project phases before initiation of phase I construction in 1998. Each project reach will then be re-mapped after construction is finished to document changes in habitat area. Monitoring habitat use will include four years of seining, and annually for spawning.

3.3 Riparian Resources

Similar to the SRP 9 and 10 projects, a major component of the Gravel Mining Reach project is riparian revegetation. Native riparian vegetation consists of different plant assemblages called plant series (Sawyer 1995). Currently the riparian vegetation is restricted to levees and relic stands, and is imbedded with exotic plants. Construction will disturb some riparian vegetation and off-channel wetlands, but will be mitigated by extensive revegetation. The revegetation objectives in the Gravel Mining Reach are to establish different plant series on reconstructed surfaces with inundation patterns characteristic of that plant series, provide continuity between remnant riparian stands, and increase natural regeneration.

A major addition to revegetation methods in the Gravel Mining Reach project is use of bioengineered bank protection in Phases I, II and III. Bioengineering uses plant materials together with inert materials during construction to protect and stabilize riverbanks. In the Gravel Mining Reach bioengineering will take two forms: joint plantings and brush mattressing. Joint plantings consist of soil rammed into the spaces between rip-rap, and planted with willow or cottonwood cuttings. Brush mattressing consists of willow cuttings woven into a large "mattresses", and anchored to the riverbank through trenches and backfill and large "pins" made of live willow stakes. Bioengineered banks become stronger over time and provide excellent habitat value. The Gravel Mining Reach includes monitoring to evaluate the integrity of bioengineered structures during the first five years after construction.

3.3.1 Project Performance

Riparian monitoring will evaluate project performance using plot-based descriptions of species composition, survival, and cover to evaluate recruitment, survival and growth. Potential performance standards for plantings are: 90 % plant survival in year 0, 70% plant survival to year 2, and 60% survival to year 3, a 10% increase in cover and growth annually for surviving plants, and no more than ten planted hardwoods dead in a 3 meter radius. Plantings will be irrigated in the first and second growing season after revegetation. Trends in survival will be documented and used to evaluate project success in establishing self sustaining vegetation series. Quantitative performance standards will be correlated to revegetation techniques such as design, planting and irrigation methods, fertilizer, root stock quality, and environmental causes.

Plot descriptions will sample plant series on each restored geomorphic surface, including the active channel, floodplain and terrace. Three permanent plots will be established within each restored series type, with each plot located along cross sections established for geomorphic monitoring. Data collected within plots will include dominant species, plant vigor, and plant size in the tree, shrub, and herb strata. Plant vigor will be assessed using visual decline indicators (for example, yellowing or burnt leaves, leaf abscission, stunted growth, irregular plant morphology, or stem death). Plant size assessment will be based on root collar or breast height diameter and height. Plant density, and survivorship will also be calculated. Changes in plant size, vigor or species composition will be used to evaluate revegetation success. It will be necessary to protect trees from beavers and this may include temporary depredation permits from CDFG.

Bioengineering Response

Each bioengineered structure will be visually inspected to evaluate structural responses to floods. Photo-monitoring points will be established immediately after construction and re-photographed during subsequent monitoring. When possible, photos will be taken at the same time of year and during a similar discharge. Photos will be overlaid and used for photogrammetric analysis to document the extent of plant growth between monitoring and the extent of erosion. Failure nodes will be documented to determine the cause of failure. Bioengineering will be assumed effective if the structure is growing well in all areas and visual inspection indicates there is minimal erosion.

Schedule: Project performance monitoring will begin immediately after construction (year-0) to evaluate planting success and document as-built conditions, and again at year-2 at the end of irrigation (contractual signed off pending results). Additional monitoring will occur in years 3 and 5, or potentially after a high flow event that exceeds the channel geomorphic design flow (assumed to be 5,000 cfs) and inundates reconstructed floodplains. The final riparian vegetation monitoring will occur in 2004 for Phase I, 2005 for Phase II, 2006 for Phase III, and 2007 for Phase IV, for a maximum 4 monitoring seasons for the first 5 years after construction. Bioengineering will be monitored after each of three high flow events that exceeds the design flow (that may cause bank erosion) for 5 years after construction, or once at years 3 and 5 if no high flow events occur.

3.4 Wetlands

Please refer to Section 2.4.

3.5 Threatened and Endangered Species

Please refer to Section 2.5.

3.6 Transportation/Circulation

Please refer to Section 2.6.

3.7 Air Quality

Please refer to Section 2.7.

3.8 Noise

Please refer to Section 2.8.

3.9 Aggregate Resources

The Gravel Mining Reach is a significant sand and gravel resource area in the County and is subject to approximately six separately approved mining use permits and SMARA-mandated reclamation plans. Each permit contains detailed conditions, operational parameters, reclamation requirements and financial guarantees based on those plans. Most of the permits have been subject to CEQA review and have mandatory mitigation measures attached. Implementation of the Mining Reach Restoration Project will affect all of the existing permits and as a result, modifications to these permits will be needed, new conditions will have to be developed, and reclamation plans will have to be revised along with their respective financial guarantees. The revision of these permits is necessary for project implementation as the currently approved permits would conflict with the restoration work.

The following process was developed, in consultation with the County, and is being proposed to facilitate the required County Use Permit modification process. As proposed, the process requires TID to act as Lead Agency (with Modesto Irrigation District, as co-licensee for the New Don Pedro Project) and the County as Responsible Agency, whereby the County will be able to review and consider for approval all permit actions at one time, with one hearing. This proposed "Blanket Permit" approach is described in further detail below. If the County has a concern regarding this process, TID will make a good faith effort to resolve any concerns.

3.9.1 Blanket Permit Process & Components

In order to efficiently obtain the required permits from the County, and in so doing, reduce the burden on affected miners/property owners while successfully implementing the restoraton and mitigation projects, a "blanket" permit (as opposed to individual permits) process is proposed. Using this "blanket" approach, one permit will be used to address the entire project area. This will require close coordination with the